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Calspan Corporation
Buffalo, New York 14221


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B-1 SYSTEMS APPROACH TO TRAINING
TECHNICAL MEMORANDUM SAT-4

SORTING MODEL FOR B-1 AIRCREW TRAINING DATA. USER'S AND PROGRAMMER'S GUIDE

JULY 1975

PREPARED BY: John R. Menig
John R. Menig

APPROVED BY: Robert C. Sugarman
Robert C. Sugarman
SAT Task Manager

Thomas A. Ranney
Thomas A. Ranney

APPROVED BY: Thomas R Benedict
Thomas R. Benedict, Head
Computer Mathematics Dept.

APPROVED BY: Richard L Taylor for
Robert C. Kidder
Program Manager
B-1 Technical Support Program

CALSPAN CORPORATION
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This report describes how the Sorting Model can be used to store, retrieve, and update aircrew task analysis and control/display data. The

The report is divided into two parts. Part 1, User's Guide gives the details necessary to run the program; Part 2, Programmer's Guide supplements Part 1 by describing the program logic.

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PREFACE

This document is one of several technical memoranda which have been delivered to the B-1 Systems Project Office (B-1 SPO) in performance of the Systems Approach to Training (SAT) Task under Contract Number F33657-75-C-0021. Each of the separate SAT documents is listed below. Additional copies may be requested from: B-1 Systems Project Office, Data Configuration Division, Wright-Patterson Air Force Base, Ohio.

Technical Memoranda	Number	Author(s)	Date
B-1 Systems Approach to Training, Final Report.	SAT- 1 Vol. 1	R. Sugarman S. Johnson W. Ring	July 1975
B-1 Systems Approach to Training, Final Report. Appendix A: Cost Details.	SAT- 1 Vol. 2	H. Reif W. Ring	July 1975
B-1 Systems Approach to Training, Final Report. Appendix B: Bibliography and Data Collection Trips.	SAT- 1 Vol. 3	A. Blair	July 1975
Behavioral Objectives for the Pilot, Copilot, and Offensive Systems Operator.	SAT- 2 Vol. 1 & 2	J. Mitchell W. Hinton S. Johnson	July 1975
Simulation Technology Assessment Report (STAR).	SAT- 3	S. Johnson J. Knight R. Sugarman	July 1975
Sorting Model for B-1 Aircrew Training Data. User's and Programmer's Guide.	SAT- 4	J. Menig T. Ranney	July 1975
Training Resources Analytic Model (TRAM). User's Manual.	SAT- 5	W. Ring G. Gaidasz J. Menig W. Stortz	July 1975
Training Resources Analytic Model (TRAM). Programmer's Manual.	SAT- 6	W. Ring G. Gaidasz J. Menig	July 1975
Task Analysis Listings.	SAT- 7	J. Mitchell T. Ranney	July 1975
Control/Display Catalog and Action Verb Thesaurus.	SAT- 8	T. Ranney A. Blair	July 1975

FORWARD

The report was prepared by Calspan Corporation for B-1 System Program Office, Wright-Patterson Air Force Base, Ohio. The system was developed during the period of July 1974 through June 1975.

Major C. C. Buckenmaier served as the contract technical monitor. Dr. R. C. Sugarman was the Project Scientist. Mr. W. F. Ring was the Task Scientist. Programs were designed and written by Mr. E. C. Pringle and Mr. J. R. Menig.

Special thanks are due Messrs. W. D. Fryer and T. J. Wojcinski who edited this report.

Acknowledgement is also made of other Calspan Corporation personnel: Mr. S. L. Johnson and Ms. A. J. Blair.

July 1975
SAT-4

CALSPAN CORPORATION

SORTING MODEL FOR B-1 AIRCREW TRAINING DATA USER's AND PROGRAMMER's GUIDE

by

John R. Menig
and
Thomas A. Ranney

ABSTRACT

This report describes how the Sorting Model can be used to store, retrieve, and update B-1 Aircrew task analysis and control/display data.

The report is divided into two parts. Part 1, User's Guide gives the details necessary to run the program. Part 2, Programmer's Guide supplements Part 1 by describing the program logic.

PART 1

USER'S GUIDE

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LIST OF FIGURES

LIST OF FIGURES (CONTD.)

LIST OF EXAMPLES

INTRODUCTION AND SUMMARY

To aid in the maintenance of task element and control/display data, a system of programs has been developed. This system is referred to as the Sort Model. The Sort Model has provided for the operations of file maintenance and retrieval of data.

File Maintenance subsystems allow the addition of new records, deletion of records, and the replacement of fields within a record. There are separate File Maintenance subsystems for task element data and control/display data.

The Query subsystem provides for the retrieval of a subset of data from either file (ie. task element file or control/display file.) This selection process is carried out at two levels. First, records must satisfy the conditions specified in a boolean conditional statement. Second, from these records that have been selected, only a subset of the data within the records is displayed. One Query subsystem provides for the retrieval of data from either file.

In addition to these subsystems, there are several special purpose report programs. These programs have been provided because some reports have unique requirements that could not be reasonably integrated into the Query subsystem.

The remainder of this report is divided into six sections. Section 1 covers the File Maintenance subsystem for the control/display file. Section 2 covers the File Maintenance subsystem for the task element file. Section 3 covers the Query subsystem. Section 4 contains the description of the special purpose report programs. Section 5 describes the format of task element and control/display variables. Possible program enhancements are the subject of Section 6

1. FILE MAINTENANCE SUBSYSTEM FOR CONTROL/DISPLAY DATA

1.1 Purpose

The File Maintenance subsystem for the control/display file permits record-by-record updating of control/display data. Record additions, record deletions, and field replacements are permissible operations

1.2 Description

Figure 1.1 contains the flow diagram of the decisions and the sequence of operations of which the user of this subsystem should be aware. A tape back-up for the control/display file is available and can be used to reinstate the control/display direct access file. This feature permits the user to step back to a previous version of the control/display file. After the control/display file is updated, the results should be examined. If satisfactory, the file should be copied onto the back-up tape, inverted lists should be created and the inverted lists should be packed. The purpose of the inverted list will be described in Section 3. If the file is still unsatisfactory after file maintenance operations have been performed, then additional file maintenance operations are required or it may be easier to reinstate the direct access file and begin file maintenance again.

Figure 1.2 shows all programs in the subsystem and all input and output data sets. The File Maintenance subsystem consists of the following six programs:

- Reinstate Control/Display File Program
- Control/Display File Maintenance Program
- Back-up Control/Display File Program
- Create Control/Display Inverted Lists Program
- Sort Program
- Pack Inverted Lists Program

These programs will now be described.

1.2.1 Reinstate Control/Display File Program

1.2.1.1 Purpose

Used to reinstate control/display file.

1.2.1.2 Input

The control/display back-up tape (unit 99) is the only input file.

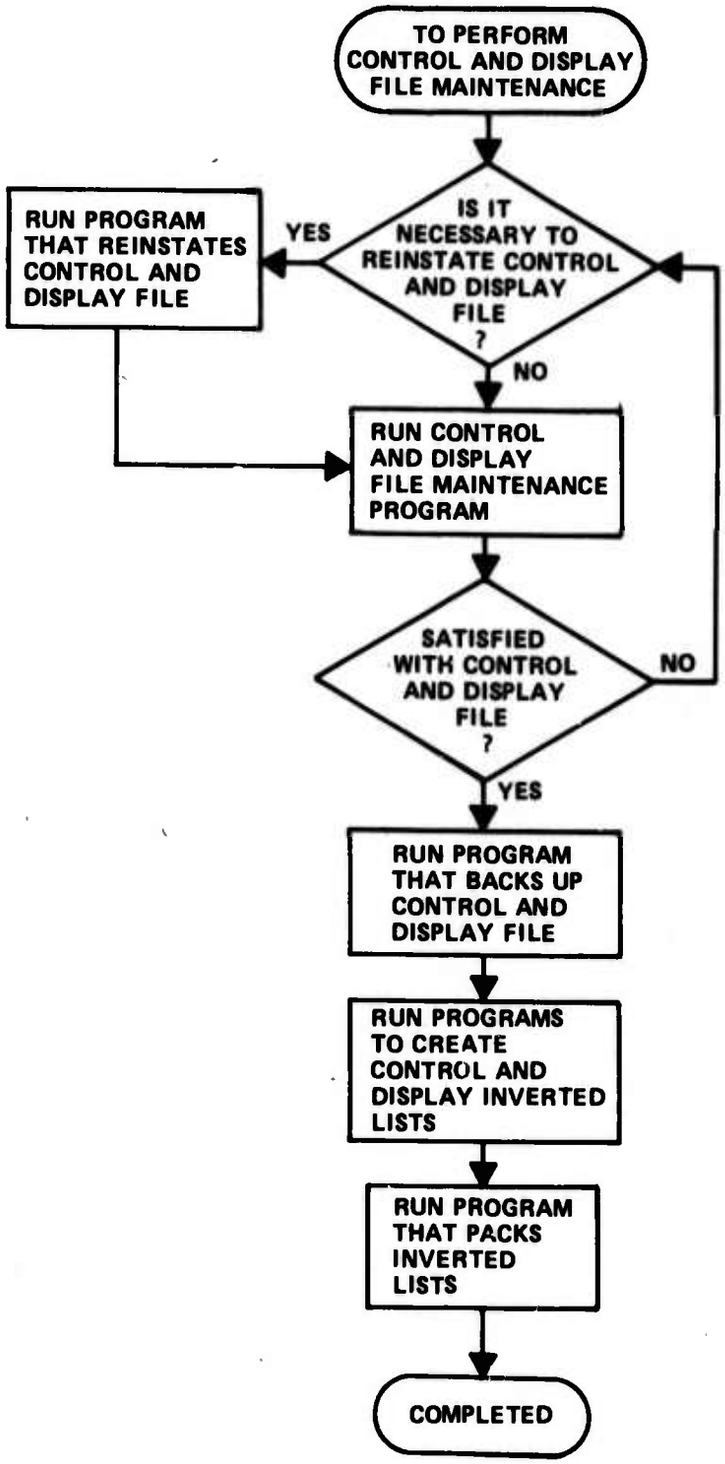

Figure 1.1 HOW TO UPDATE THE CONTROL/DISPLAY FILE

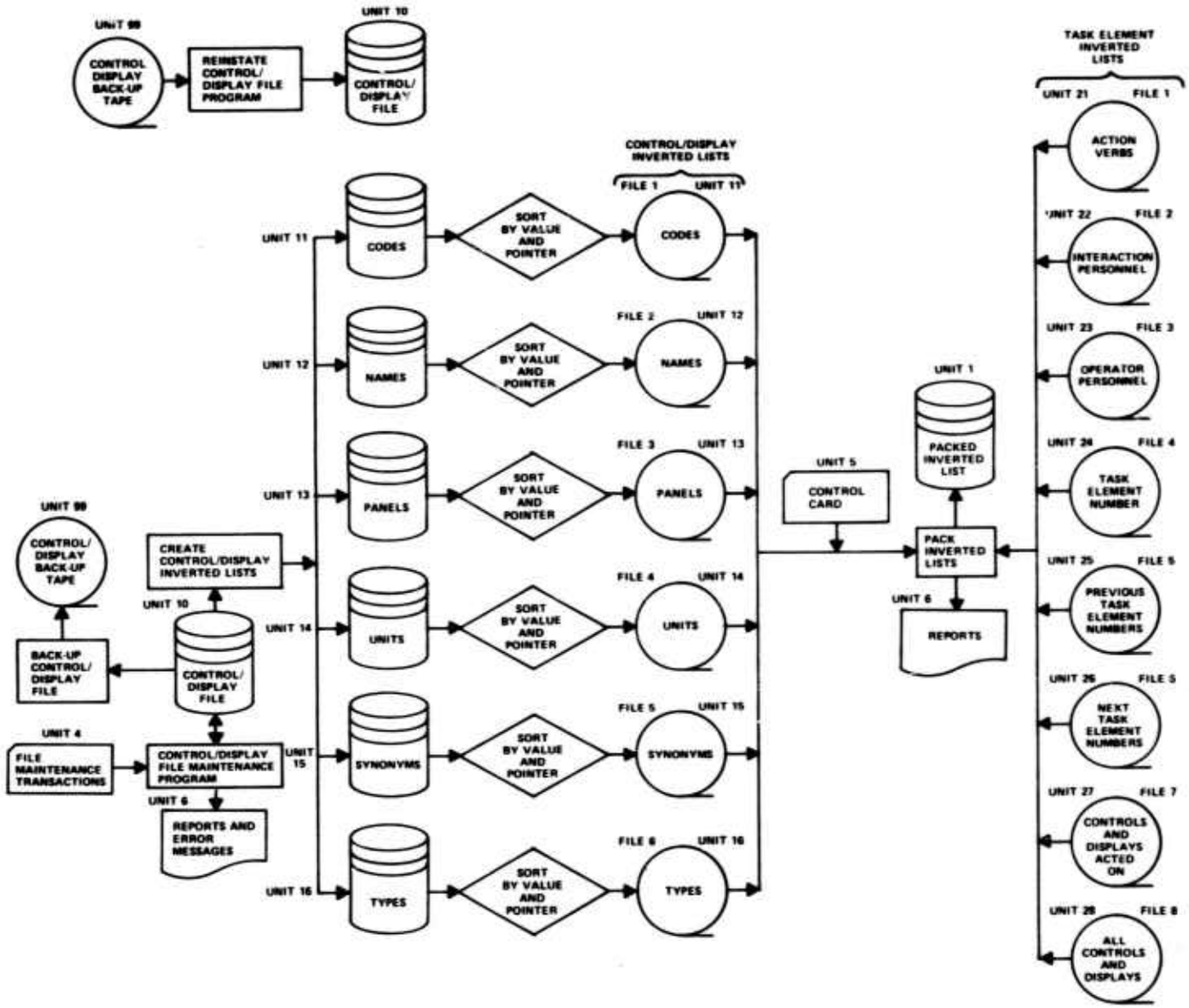

Figure 1.2 CONTROL AND DISPLAY FILE MAINTENANCE SUBSYSTEM

1.2.1.3 Output

The control/display file (unit 10) is the only output file. The I/O (input/output) count on unit 10 should be checked to see that the file was created. The I/O count for unit 10 should be 2000.

1.2.1.4 JCL (Job Control Language)

To be delivered.

1.2.2 Control/Display File Maintenance Program

1.2.2.1 Purpose

Used to modify the control/display file. Refer to Appendix A for the description of control/display records and variables.

1.2.2.2 Input

The transaction file (unit 4) and the control/display file (unit 10) are the only input files.

The transaction file contains the card images necessary to perform the three file maintenance operations:

- Record Adds
- Record Deletes
- Field Replaces

For each file maintenance operation, a header card is required. The header card for record adds has the format: *ADD (starting in first column.) The format for the delete record operation header card is *DELETE (starting in the first column), followed by at least one blank, followed by code number, followed by at least one blank, then the record number. The format for the field replace operation header card is the same as for the delete record header card except the key word *REPLACE is substituted for the key word *DELETE. The code number is the control/display code number. The record number is a unique number assigned to the record when the record is added. Whenever a record is deleted, the record number becomes available for a future record addition. The record number is printed when the record is added and when detail list queries (described in Section 3) are made.

For record adds, the header card is followed by record definition cards. Record definition cards are described in Appendix A. Note that any number of control/display record descriptions can follow the header card.

For record deletes, only the header card is required. There must be one header card for each record to be deleted.

For field replacements, the header card is followed by replacement cards. The format of the replacement card is the mnemonic for the field being replaced in column 1, followed immediately by an equal sign and the new value. The new value must begin immediately after the equal sign. Any blanks between the equal sign and the new value are considered to be part of the value. See Figure A.4 for the mnemonics for the control/display records. Note that any number of fields can be replaced.

See Example 1 for examples of these operations.

1.2.2.3 Output

The control/display file (unit 10) and the report file (unit 6) are the only output files.

The report file contains a listing of the inputs, shows the effects of the transactions, and contains error messages. See Example 1.

1.2.2.4 JCL

To be delivered.

1.2.3 Back-Up Control/Display File Program

1.2.3.1 Purpose

Used to create a back-up tape for the control/display file, that can be used later to reinstate the file.

1.2.3.2 Input

The control/display file (unit 10) is the input file.

1.2.3.3 Output

The control/display tape (unit 99) is the output file. The I/O count on unit 99 should be checked to see that the file was copied. The I/O count for unit 10 should be 63.

1.2.3.4 JCL

To be delivered.

1.2.4 Create Control/Display Inverted Lists Program

1.2.4.1 Purpose

Creates inverted lists for frequently retrieved parameters.

1.2.4.2 Input

The control/display file (unit 10) is the input.

1.2.4.3 Output

There are six output files, each of which is an inverted list:

- Codes (unit 11)
- Names (unit 12)
- Panels (unit 13)
- Units (unit 14)
- Synonyms (unit 15)
- Types (unit 16)

1.2.4.4 JCL

To be delivered.

1.2.5 Sort

1.2.5.1 Purpose

To sort each of the inverted lists, in anticipation of later binary search applied to these lists when performing queries.

1.2.5.2 Input

The inverted list file and a control card file are used as inputs to the sort.

The control file contains the following cards (start in column 2):

```
SORT FIELDS=(5,13,CH,A)                 (for code file)
SORT FIELDS=(5,30,CH,A,37,4,FI,A)       (for name file only)
SORT FIELDS=(5,4,CH,A,37,4,FI,A)        (for panel file only)
SORT FIELDS=(5,20,CH,A,37,4,FI,A)       (for units file only)
SORT FIELDS=(5,20,CH,A,37,4,FI,A)       (for synonym file only)
SORT FIELDS=(5,20,CH,A,37,4,FI,A)       (for type file only)
END
```

1.2.5.3 Output

The sorted inverted list file and the standard SORT/MERGE messages are the only outputs.

1.2.5.4 JCL

To be delivered.

1.2.6 Pack Inverted Lists Program

1.2.6.1 Purpose

Used to create a direct access file containing all inverted lists (including task element inverted lists.)

1.2.6.2 Input

The input contains one control card (unit 5) and 14 inverted list files (units 11-16 and 21-28).

The control card informs the program what files are to be read. This card for the present system is: 11,12,13,14,15,16,21,22,23,24,25, 26,27,28 (format 40I2).

1.2.6.3 Output

The packed inverted lists are stored on unit 1 and a report (unit 6) is given indicating the number and size of the inverted lists.

1.2.6.4 JCL

To be delivered.

2. FILE MAINTENANCE SUBSYSTEM FOR B-1 AIRCREW TRAINING DATA

2.1 Purpose

The File Maintenance subsystem for the task element file permits record-by-record updating of task element data. Record additions, record deletions, field replacements, and task element renumbering are permissible operations.

2.2 Description

Figure 2.1 contains the flow diagram of the decisions and the sequence of operations of which the user of this subsystem should be aware. The action verb thesaurus is used to test the validity of action verbs. If the action verb thesaurus needs updating, this should be accomplished prior to updating the task element file. The control/display file is used to test the validity of controls and displays used in task element records. The control/display file should be modified, if required, before doing file maintenance on the task element file. A tape back-up for the task element file is available and can be used to reinstate the task element direct access file. This feature permits the user to

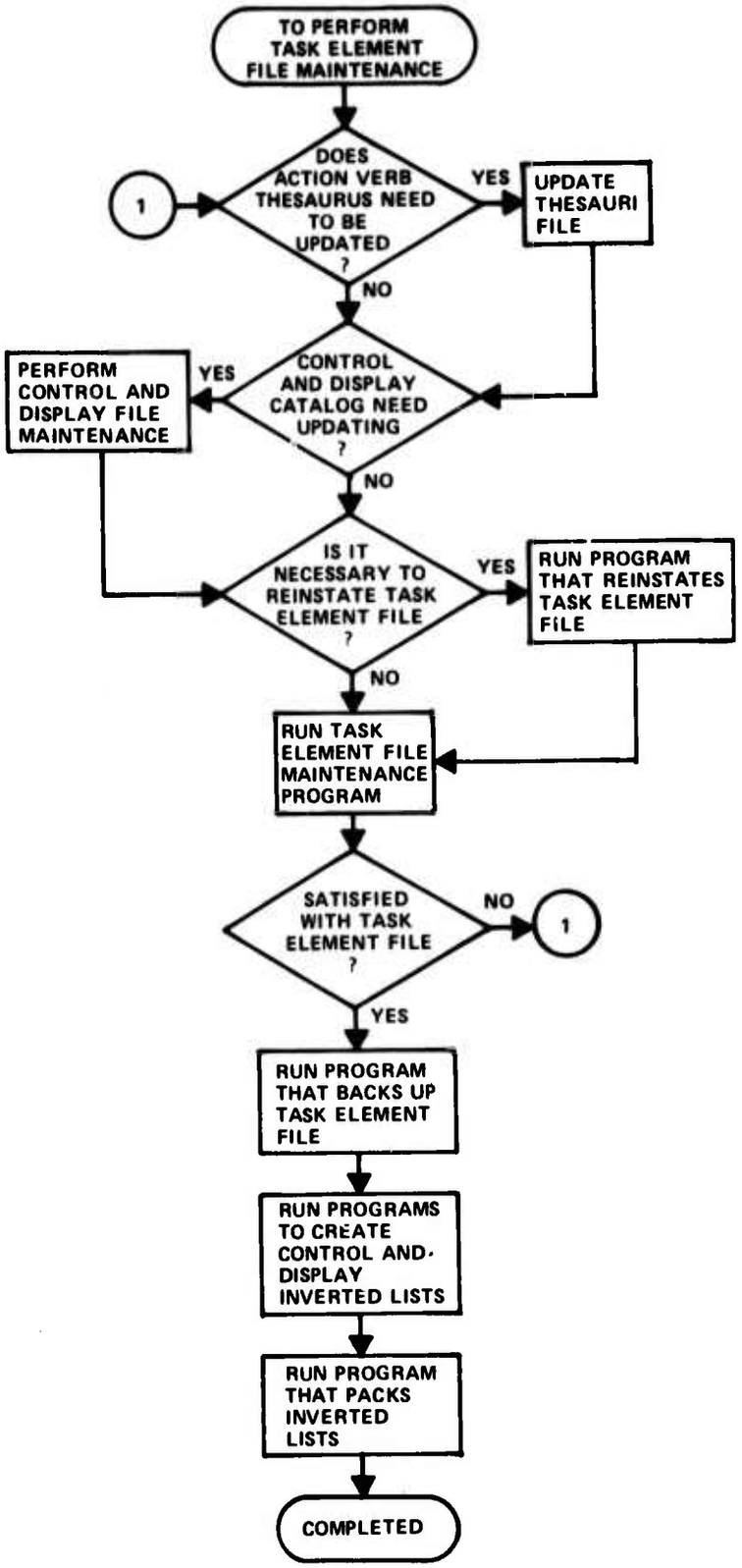

Figure 2.1 HOW TO UPDATE THE TASK ELEMENT FILE

step back to a previous version of the task element file. After updating of the task element file, the results should be copied onto the back-up tape, inverted lists should be created, and the inverted lists should be packed. If the file, after file maintenance operations have been performed, is still unsatisfactory then additional file maintenance operations are required or it may be easier to reinstate the direct access file and begin file maintenance again.

Figure 2.2 shows all programs in the subsystem including all input and output data sets. The File Maintenance subsystem consists of the following six programs:

- Reinstate Task Element File Program
- Task Element File Maintenance Program
- Back-up Task Element File Program
- Create Task Element Inverted Lists Program
- Sort Program
- Pack Inverted Lists Program

2.2.1 Reinstate Task Element File Program

2.2.1.1 Purpose

Used to reinstate task element file.

2.2.1.2 Input

The task element back-up tape (unit 99) is the only input file.

2.2.1.3 Output

The task element file (unit 20) is the only output file. The I/O count on unit 20 should be checked to see that the file was created. The I/O count for unit 20 should be 2100.

2.2.1.4 JCL

To be delivered.

2.2.2 Task Element File Maintenance Program

2.2.2.1 Purpose

Used to modify the task element file. Refer to Appendix B for the description of task element records and variables.

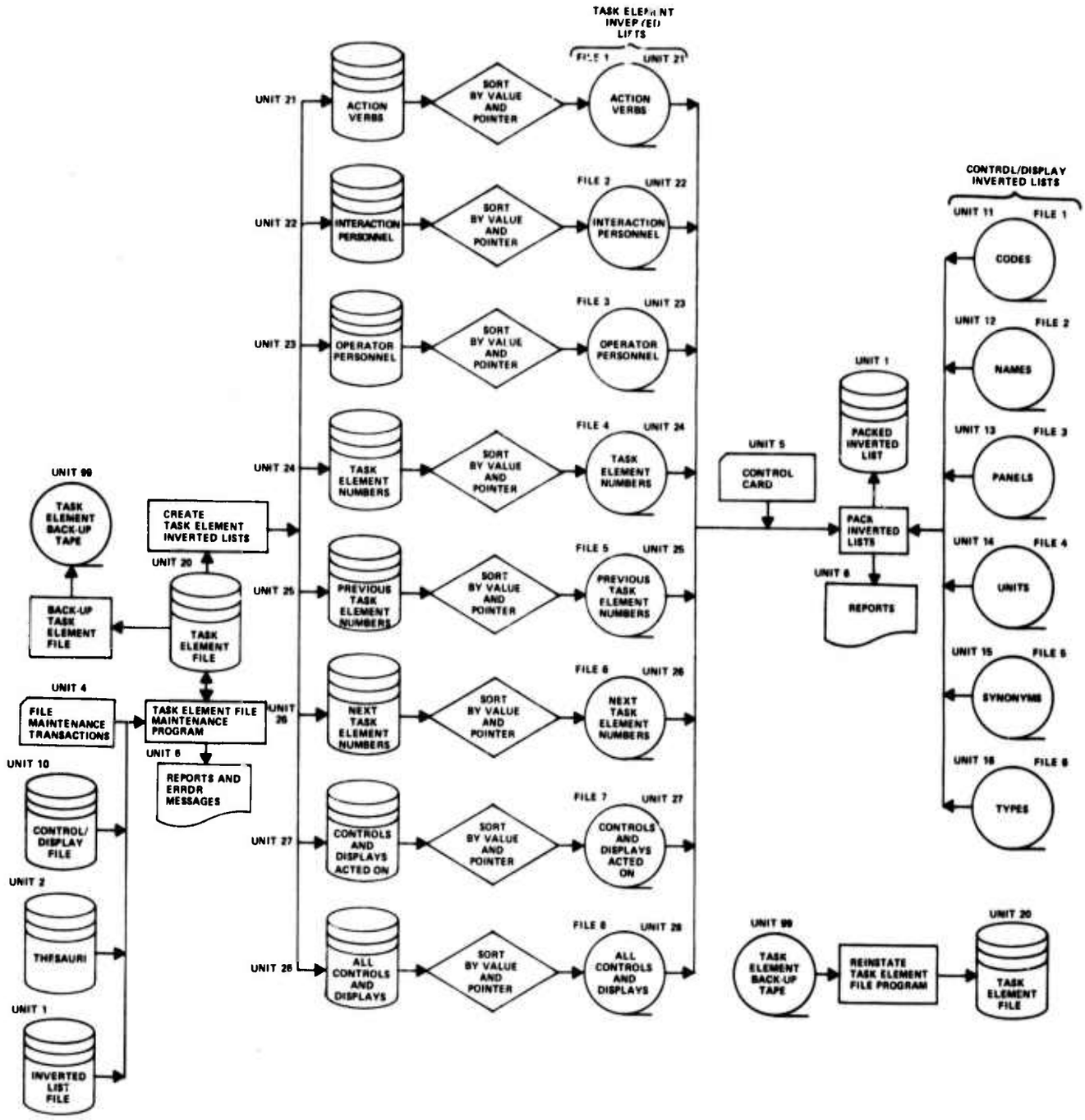

Figure 2.2 TASK ELEMENT FILE MAINTENANCE SUBSYSTEM

2.2.2.2 Input

The transaction file (unit 4), task element file (unit 20), control/display file (unit 10), the thesauri file (unit 2), and the packed inverted list file (unit 1) are the input files required.

The transaction file contains the card images necessary to perform the four file maintenance operations:

- Record Adds
- Record Deletes
- Field Replacements
- Renumbering

For each file maintenance operation, a header card is required. The header card for record adds has the format: *ADD (starting in first column). The format for the delete record operation header card is *DELETE (starting in first column), followed by at least one blank, followed by task element number, followed by at least one blank, then the record number. The format for the field replace operation header card is the same as for the delete record except the key word *REPLACE is substituted for the key word *DELETE. The header card for the renumber operation is *NUM (starting in column 1.) The task element number is the unique number assigned to the task element and has the format aa.b.c.ddd.ee, where aa is the mission segment level, b is the function level, c is the task level, ddd is the task element level and ee is the sub-task element level. The record number is a unique number assigned to the record when the record is added. Whenever a record is deleted, the record number becomes available for a future record addition. The record number is printed when the record is added and when detail list queries (described in Section 3) are made.

To perform record adds, the header card is followed by record definition cards. Record definition cards for the task element file are described in Appendix B. Note that any number of task element record descriptions can follow the header card.

For record deletes, only the header card is required. There must be one header card for each record to be deleted.

For field replacement, the header card is followed by replacement cards. The format of the replacement card is the mnemonic for the field being replaced in column 1, followed immediately by an equal sign and the new value. Any blanks between the equal sign and the new value are considered to be part of the value. Column 80 cannot be used for data. A non-blank character in column 80 indicates the value is continued on the next card. One and only one continuation card is permitted. The value on the second card is concatenated with the value on the first card (up to column 79). All trailing blanks from the first card and leading blanks from the second card are included in the value. The value must begin on the first card.

See Figure B.7 for the mnemonics for the element record fields. Note that any number of fields can be replaced.

For the task element renumbering operation, the header card is followed by the renumbering instruction. The purpose of this renumbering operation is to allow the task element numbers in task element records to be changed and to change references to them in other task element records. This operation allows renumbering at mission segment, function, task, task element and sub-task element levels. The operation is performed on all task elements at the level requested. The description of renumbering instructions and examples will help make this concept clearer.

The format of the renumbering instruction is:

column 1 blank (b) - the level for renumbering is to be determined from the task element number

or S - renumber at sub-task level

columns 2-14 aa.b.c.ddd.ee - task element number

columns 15-19 (Format I5) n - the number to be added to the task element number at the appropriate level

Note the following conditions and what they indicate

- if card has the form Saa.b.c.ddd.00bn, renumbering will be performed at the sub-task element level for all task elements starting at sub-task element aa.b.c.ddd.00 in task element aa.b.c.ddd.
- if card has the form baa.b.c.ddd.00bn, renumbering will be performed at the task element level for all task elements starting at aa.b.c.ddd.00 in task aa.b.c.
- if card has the form baa.b.c.ddd.eebn, renumbering will be performed on the sub-task element level for all task elements starting at sub-task element aa.b.c.ddd.ee in task element aa.b.c.ddd.
- if card has the form baa.b.c.000.00bn, renumbering will be performed at the task level for all task elements starting at aa.b.c.001.00 in function aa.b.
- if card has the form baa.b.0.000.00bn, renumbering will be performed at the function level for all task elements starting at aa.b.1.001.00 in mission segment aa.

- if card has the form ßaa.0.0.000.00ßn, renumbering will be performed at the mission segment level for all task elements starting at aa.1.1.001.00.

These examples were for positive n. For negative n, the absolute value of n is added to task element number at the level where the renumbering is to be performed to determine the starting task element number. For example, ßaa.b.c.000.00ß-n renumbering will be performed at the task level for all task elements starting at a.b.c+|n|.001.00 in function aa.b.

Renumbering with positive n creates holes where new task elements can be inserted. Renumbering with negative n eliminates holes. When creating a hole (n positive), the task element number points at where the hole is to be created and n indicates the size of the hole. When eliminating a hole (n negative), the task element number points at where the hole begins and |n| indicates the size of the hole.

Here it is assumed that when aa,bbb,c,ddd,ee are specified, they are not zeroes. Any number of renumbering instructions can be given but they must be non-overlapping (i.e., no two instructions can affect the same task element number.)

The control/display file (unit 10) and thesauri file (unit 2) are used to verify that the controls/displays and action verbs used in the description of task elements are correct. The packed inverted list file (unit 1) is used in accessing the control/display file. See Example 2 for examples of these operations.

2.2.2.3 Output

The task element file (unit 20) and the report file (unit 6) are the only output files.

The report file contains a listing of the input, shows the effects of the transactions, and contains error messages. See Example 2.

2.2.2.4 JCL

To be delivered.

2.2.3 Back-up Task Element File Program

2.2.3.1 Purpose

Used to create a back-up tape for the task element file that can be used later to reinstate the file.

2.2.3.2 Input

The task element file (unit 20) is the input file.

2.2.3.3 Output

The task element task (unit 99) is the output file. The I/O count in unit 20 should be checked to see that the file was copied. The I/O count for unit 99 should be 111.

2.2.3.4 JCL

To be delivered

2.2.4 Create Task Element Inverted Lists Program

2.2.4.1 Purpose

Creates inverted lists for frequently retrieved parameters.

2.2.4.2 Input

The task element file (unit 10) is the input.

2.2.4.3 Output

There are eight output files, each of which is an inverted list:

- Action Verbs (unit 21)
- Interaction Personnel (unit 22)
- Operator Personnel (unit 23)
- Task Element Numbers (unit 24)
- Previous Task Element Numbers (unit 25)
- Next Task Element Numbers (unit 26)
- Controls/Displays Acted On (unit 27)
- All Controls/Displays Referenced (unit 28)

2.2.4.4 JCL

To be delivered.

2.2.5 Sort

2.2.5.1 Purpose

To sort each of the inverted lists, in anticipation of later binary search applied to these lists when performing queries.

2.2.5.2 Input

The inverted list file and a control card file are used as inputs to the sort.

The control card file contains the following cards (start in column 2):

```
SORT FIELDS=(5,20,CH,A,37,4,FI,A)    (for action verb file only)
SORT FIELDS=(5,1,CH,A,37,4,FI,A)     (for interaction file only)
SORT FIELDS=(5,1,CH,A,37,4,FI,A)     (for operator file only)
SORT FIELDS=(5,13,CH,A,37,4,FI,A)    (for task element number file only)
SORT FIELDS=(5,13,CH,A,37,4,FI,A)    (for previous task element number
                                      file only)
SORT FIELDS=(5,13,CH,A,37,4,FI,A)    (for next task element number file
                                      only)
SORT FIELDS=(5,30,CH,A,37,4,FI,A)    (for controls/displays acted in
                                      file only)
SORT FIELDS=(5,30,CH,A,37,4,FI,A)    (for controls/displays referenced
                                      file only)
END
```

2.2.5.3 Output

The sorted inverted list file and the standard SORT/MERGE messages are the only outputs.

2.2.5.4 JCL

To be delivered.

2.2.6 Pack Inverted List Program

2.2.6.1 Purpose

Used to create a direct access file containing all inverted lists (including the inverted list for the control/display file.)

2.2.6.2 Input

The input contains one control card (unit 5) and 14 inverted list files (units 11-16 and 21-28).

The control card informs the program what files are to be read. This card for the present system is 11,12,13,14,15,16,21,22,23,24,25,26, 27,28 (format 40I2)

2.2.6.3 Output

The packed inverted lists are stored on unit 1 and a report (unit 6) is given indicating the number and sizes of the inverted lists.

2.2.6.4 JCL

To be delivered.

3. QUERY SUBSYSTEM

3.1 Purpose

The query subsystem permits the retrieval of a subset of either the control/display file or task element file data.

3.2 Description

Figure 3.1 contains the flow diagram of the decisions and the sequence of operations of which the user of this subsystem should be aware. When necessary, update the control/display file and task element file prior to performing queries.

Figure 3.2 shows all input and output data sets required by the query program.

The general format of a query is a *report-type WHEN boolean-expression; the following are acceptable report-types:

- PRINT $v_1 \ldots v_n$
- PRINT-SORTED $v_1 \ldots v_n$
- DETAIL-LIST TE
- DETAIL-LIST CD
- STORY-BOOK TE

The word WHEN and boolean expression are eliminated when the entire file is to be processed; otherwise, the record is selected to be printed only if the boolean expression evaluates to true.

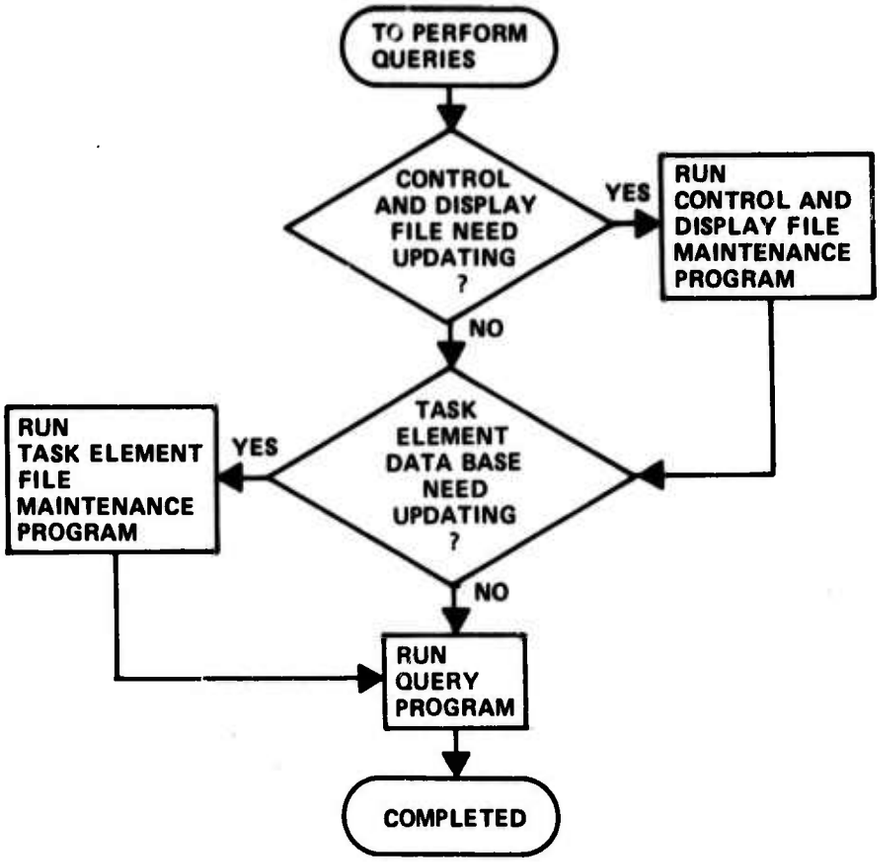

Figure 3.1 HOW TO PERFORM A QUERY

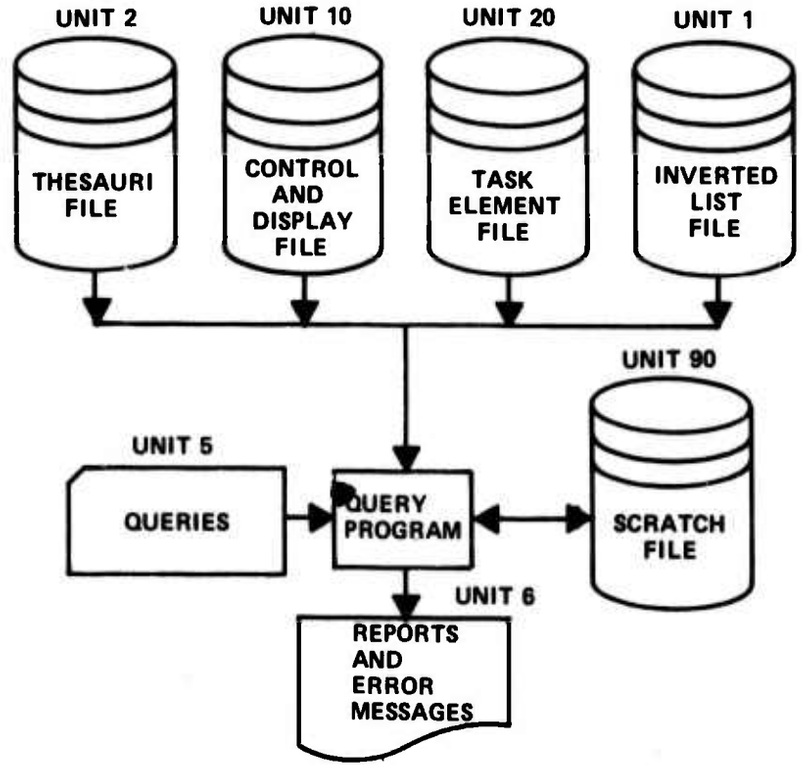

Figure 3.2 QUERY SUBSYSTEM

Report type PRINT $v_1 \ldots v_n$ ($1 \leq n \leq 10$) informs the query subsystem that from the record selected that the variables $v_1 \ldots v_n$ are to be displayed. The values of these variables are arranged in columns.

Report type PRINT-SORTED $v_1 \ldots v_n$ ($1 \leq n \leq 10$) informs the query subsystem that from the records selected that the variables $v_1 \ldots v_n$ are to be displayed. The values of these variables are arranged in columns. The lines are sorted by the first four characters of the first variable.

Report type DETAIL-LIST TE gives a detailed listing of all variables and values in the selected task element records. The purpose for this report is to help in the file maintenance of the task element file. This report also displays the record number of the selected records.

Report type DETAIL-LIST CD gives a detailed listing of all variables and values in the selected control/display records. The purpose for this report is to help in the file maintenance of the control/display file. This report also displays the record numbers of the selected records.

Report type STORY-BOOK TE gives a special report of all task elements selected. This report contains the task element number, task element description (or id), action verb, controls/displays, initiation cue and the first completion cue.

The boolean expression is made up of up to 15 relational expressions, any number of pairs of parentheses, and the following boolean operators:

- + boolean conjunction (AND)
- / boolean inclusive disjunction (OR)

Both of these boolean operators have the same precedence. The boolean expression is evaluated from left to right. Parentheses can be used to change the order of evaluation.

The relational expressions have the following format:

variable relational-operator value

The variable is an alphanumeric name that has been assigned to a field within records contained in the file being searched. The value is one of possibly many values the variable may have. The following relational operators are permitted:

- = equal to
- ¬ = not equal to
- > greater than
- > = greater than or equal to
- < less than
- < = less than or equal to.

These relational operators apply to alphanumeric data as well as to numeric data. In the former case, the value is tested lexically (alphanumeric order).

In a query, blanks can occur anywhere except:

- within variable names
- between symbols in relational operators: ¬=, >=, <=

If a value contains embedded blanks or special characters (;¬=><+/), it must be enclosed within parentheses. Blanks are required in the following places:

- before and after the word WHEN
- between variables in PRINT and PRINT-SORTED requests
- between the words DETAIL-LIST and TE or CD
- between the words STORY-BOOK and TE

Blanks are used as delimiters in the preceeding situations. Where one blank can occur, any number of blanks is permissible.

Query requests are not restricted to card boundaries. Any number of cards can be used and the query can start or stop in any one of the 80 card columns. The only restriction in this regard is that each new query must start on a new card. The remainder of any card on which a query terminates can be used as a comment field.

A special constant can be used to test whether the variable was defined within the record. This constant is NULL and represents a string of blank characters. To test whether the variable was defined in the record, test whether the variable was not equal to NULL (¬=NULL). To test whether the variable was not defined for the record, ask whether the variable was equal to NULL (=NULL). Variables when not defined have all blanks stored in their position in the record.

The inverted list allows for rapid access to records in both the control/display file and task element file. There is an inverted list for what are considered the most important variables. These lists contain the value of the variable and the record number in which this value occurred. If all variables in the boolean expression have inverted lists associated with them, then it is possible to perform logical operations on those inverted lists resulting in a list of record numbers that satisfy the conditions specified. From the list of records, it is possible to directly address those records. Thus, the entire file does not need to be searched. The user of the system does not need to know whether or not the variables are in an inverted list. The program automatically decides what search method is required. Whenever the relational operator ¬= is used, the system is forced into a sequential search rather than the usual inverted list search. The inverted lists searches, in certain situations, can reduce the number of records read by a factor of 1000 to 1, relative to a sequential search. This does not mean that ¬= should be always avoided, but the user should be aware of the potential execution time increase.

There are several different types of variables:

- Basic Variables (Refer to Figures A.4 and B.7)
- Synonym Variables (Refer to Figures A.5 and B.8)
- Group Variables (Refer to Figures A.6 and B.9)
- Classified Comment Variables (Refer to Figures A.7 and B.10)

Basic variables are those variables that are used during file maintenance to update the records. They can also be used in querying the data. There is one basic variable for each field of the record.

Synonym variables are synonyms for some of the basic variables. Synonyms can only be used in queries.

Group variables are names associated with a collection of basic variables. For instance, SYNONYMS is a name that addresses basic variables SYNONYM1, SYNONYM2, SYNONYM3. When SYNONYMS is used in the variable list of a query, SYNONYM1, SYNONYM2 and SYNONYM3 are printed. When using SYNONYMS in a relational expression, the relational expression will evaluate to true if the relation holds for any one of the synonyms SYNONYM1, SYNONYM2 or SYNONYM3. Group variables can only be used in queries.

Classified comment variables are used only in parameter lists of the operation to be performed. They are used to select the topics for which the comments will be printed. See Example 3.

3.3 INPUT

The thesauri file (unit 2), control/display file (unit 10), task element file (unit 20), packed inverted list file (unit 1) and query file (unit 5) are input files to the Query Subsystem.

When querying the task element file, the tesauri file and control/display file are used to validate and normalize values in the relational expressions when action verbs or control/displays are used.

The scratch file is used as a temporary file for sorting of data for PRINT-SORT requests.

3.4 OUTPUT

The report file (unit 6) is the only output file.

3.5 JCL

To be delivered.

4. SPECIAL PURPOSE REPORT PROGRAMS

4.1 CONTROL/DISPLAY - TASK ELEMENT CROSS REFERENCE REPORTS

4.1.1 Purpose

Generates a report with the control/display code number and name versus the number of the task elements that use the control/display.

4.1.2 Description

This program generates two different reports. These reports differ in that the one report is sorted by control/display code and the other report is sorted by task element number. Figure 4.1 shows all input and output data sets required by Task Element Cross Reference program. See Example 4.

4.1.3 Input

The input files for this program are the file containing packed inverted lists (unit 1), control/display file (unit 10), task element file (unit 20), and a control card (unit 5).

The format of the control card is ℓ_1 ℓ_2 (columns 1 and 2). If ℓ_1=T, then the report is sorted by control/display code. If ℓ_2=T, then the report is sorted by control/display name. When both ℓ_1 and ℓ_2 have value T, both versions of the report are created.

4.1.4 Output

The only output file is the report file (unit 6).

4.1.5 JCL

To be delivered.

5. FORMAT OF TASK ELEMENT AND CONTROL/DISPLAY VARIABLES

The task element and the control/display variables will be described in this section. The following topics will be addressed:

- Internal Representation of Values
- Representation of Values in Relation Expressions in Queries
- Representation of Values for Field Replacements

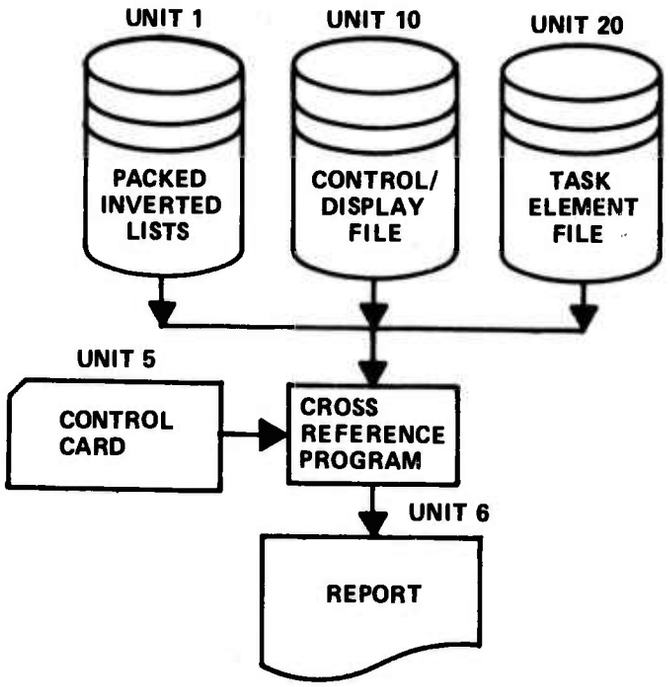

Figure 4.1 CONTROL/DISPLAY -- TASK ELEMENT CROSS REFERENCE REPORT PROGRAM

The two files are handled somewhat differently. There is more flexibility in the expression of task element variable values than there is for expressing control/display values. For the control/display file, the use of the value of variables must exactly agree with the stored value for queries, and for field replacements, the value will be stored exactly as given. For the task element file, redundant blanks are removed and values are modified by the use of the action verb thesaurus and control/display file whenever values are used in queries and field replacements. The action verb thesaurus and control/display file permit the user to specify synonyms that are converted to a standard word before applying the query or field replacement operation. In addition, there are shorthand ways to express task element values. For both relational expressions and field replacement statements, the task element values are verified and possibly modified to standardize the representation of the value; the control/display values are not verified or standardized in these expressions.

All values are stored as character strings (left justified). If the value is not defined, it contains all blanks. What are referred to as bit strings elsewhere in this document are actually stored as character strings with the following format:

$b_1 b_2 \ldots b_n$=Ø, bit is off; otherwise, bit is on.

There is one exception to this bit string format and that is in regard to the control/display type variable where b_i=0 means the bit is off.

5.1 CONTROL/DISPLAY VARIABLES (Refer to Figures A.4-A.6)

Appendix A explains how these variables are defined for record additions.

5.1.1 Code

The control/display code has the format saabbccddeeff where s is a letter representing the system and aa,...ff are two digit numbers or the characters 0X. Note that not all control/display codes require the 6 two-digit fields. Those codes requiring less than the maximum number of fields have blanks in the trailing fields.

A range of codes can be specified in a boolean expression to retrieve all records in a given system. For example, the query

...WHEN CODE > =S + CODE < T;

would retrieve all records in system S (any code starting with the letter S will be lexically greater than or equal to S and lexically less than T.)

An inverted list exists for codes.

5.1.2 Name

The control/display name is a 30-character string.

An inverted list exists for names.

5.1.3 Panel

The control/display panel is a 4-character string. Although the value is not verified, only the following values have been used:

PIL	Pilot's Panel
COP	Copilot's Panel
PCP	Pilot's and Copilot's Panel
CEN	Center Instrument Panel
CPD	Center Pedistal
LCN	Left Console
RCN	Right Console
LRCN	Left and Right Consoles
OHD	Overhead Panel
DSO	DSO Panel
OSO	OSO Panel
D+O	OSO and DSO Panels

An inverted list exists for panels.

5.1.4 Sector

The control/display sector is a 4-character string. Although the value is not verified, only the following values have been used:

UPLF	- Upper Left	RTCN	- Right Center
UPCN	- Upper Center	LOLF	- Lower Left
UPRT	- Upper Right	LOCN	- Lower Center
LFCN	- Left Center	LORT	- Lower Right
CEN	- Center		

5.15 Unit

The control/display unit is a 20-character string.

An inverted list exists for unit.

5.1.6 Type

The control/display type is a character string with format: $b_1 b_2 \ldots b_{21}$ where

if b_1=1, then control/display is of type caution
if b_2=1, then control/display is of type warning
if b_3=1, then control/display is of type advisory
if b_4=1, then control/display is of type emergency
if b_5=1, then control/display is of type lever-lock
if b_6=1, then control/display is of type guarded
if b_7-b_{20} are undefined
if b_{21}=1, then control/display is unique to B-1
Otherwise, b_i=0

An inverted list exists for unit.

5.1.7 Number of Components

The number of components is a two digit number used with codes that contain an X. (Refer to Appendix A)

5.1.8 Continuous

The continuous flag (one character), if equal to 1, indicates the first two values are to be considered as lower and upper limits of a continuous range of acceptable values for this control/display.

5.1.9 Irrelevant

The irrelevant flag (one character), if equal to 1, indicates the values are irrelevant when using the control/display file to verify values used in task element cues.

5.1.10 Synonyms

Synonyms are alternate names for the control/display. Synonyms are 20-character strings. It is up to the user to assure that synonyms are unique. If the synonyms are not unique, the system will work but may choose the wrong record when searching using synonyms.

An inverted list exists for synonyms.

5.1.11 Values

Control/display values are 16-character strings indicating the possible values or states the control/display may have.

5.1.12 Comment Classifications

Control/display comment classifications have the format: $b_1 b_2 \ldots b_9$ where

if b_1=1, comment about code
if b_2=1, comment about name
if b_3=1, comment about location
if b_4=1, comment about unit
if b_5=1, comment about type
if b_6=1, comment about value
if b_7=1, comment about synonyms
if b_8=1, comment about function
if b_9=1, comment about corrective action

Otherwise, b_i contains a blank.

5.1.13 Comments

Control/display comments are 70-character strings. Associated with each comment is a comment classification previously described.

5.2 TASK ELEMENT VARIABLES (Refer to Figures B.7 and B.10)

Appendix B explains how these variables are defined for record additions.

5.2.1 Task Element Number

The task element numbers (including previous and next task element numbers) have the format aa.b.c.ddd.ee where aa is the mission segment level, b is the function level, c is the task level, ddd is the task element level and ee is the sub-task element level. Leading zeros are not required in these fields. When this number is verified, fields aa,b,c,ddd are tested to insure they are non-zero and leading zeros are supplied when necessary.

Separate inverted lists exist for task element numbers, previous task element numbers and next task element numbers.

5.2.2 Task Element Identification

The task element id is a 60-character string. During verification, the leading and redundant blanks are removed from the task element id.

5.2.3 Cues

The task element cues (both the initiation and completion cues) are 146-character strings containing up to 3 clauses (46 characters each) and two boolean operators. The boolean operators are + (and) and / (or). The clauses have the format: control/display (30 characters or less), followed by a relational operator (1 or 2 characters), and followed by the value (up to 16 characters). The relational operators are =(equal), ¬=(not equal to), >(greater than), <(less than), >=(greater than or equal to), and <=(less than or equal to).

The verification process checks the format of each cue. The following checks are made:

1. The clauses must be connected with an acceptable boolean operator.

2. Each clause must contain one of the acceptable relational operators.

3. The control/display fields must contain either a control/display name, code number, or synonym. These fields are replaced by the control/display name when either synonym or code number is used.

4. The value is examined to see if it is acceptable for the control/display used in the clause.

When a cue is used as a value expression of a query, it must be enclosed by parentheses because the boolean and relational symbols will confuse the parsing routine used to parse the query boolean expression.

It is not necessary to pay attention to the various field lengths when using a cue in query field replacement; fields are automatically delimited by the boolean and relational symbols.

5.2.4 Operators

The task element operator is a 4-character string with the following format: $b_1b_2b_3b_4$ where

if b_1=A, the pilot is an operator

if b_2=B, the copilot is an operator

if b_3=C, the OSO is an operator

if b_4=D, the DSO is an operator

Otherwise, the corresponding character is blank.

The variable OP addresses the bit string. Using OP the specific combination of personnel is referenced. When using the variable OP in queries and field replacements, b_1 through b_4 can be specified in any order and blanks can be omitted.

When it is desirable to access records knowing only one of the operators, the variable OPERATOR is used. The variable OPERATOR addresses the bits individually as members of a group. Using OPERATOR, the existence of at least the individual(s) as an operator(s) is indicated. OPERATOR can only be used in queries.

An inverted list exists for OPERATOR values.

5.2.5 Interaction

The task element interaction is a 10-character string with the following format: $b_1 b_2 \ldots b_n$ where

if b_1=A, the pilot is involved

if b_2=B, the copilot is involved

if b_3=C, the OSO is involved

if b_4=D, the DSO is involved

if b_5=E, the ground observer is involved

if b_6=F, the crew chief is involved

if b_7=G, The guards are involved

if b_8=H, the ground controller is involved

if b_9=I, if b_{10}=J } undefined

Otherwise, the corresponding character is blank.

The variable INTER addresses the bit string. Using INTER the specific combination of personnel is referenced. When using the variable INTER in queries and field replacements, b_1 through b_{10} can be specified in any order and blanks can be omitted.

When it is desirable to access records knowing only one of the persons involved in the interaction, the variable INTERACTION is used. The variable INTERACTION addresses the bits individually as members of a group. Using INTERACTION, the existence of the individual(s) as a person(s) involved in the interaction is indicated. INTERACTION can only be used in queries.

An inverted list exists for INTERACTION values.

5.2.6 Action Verb

The task element action verb is a 20-character string.

Redundant blanks are removed and the action verb is tested against the action verb thesaurus. If a synonym was used, the value is replaced by its standard form.

An inverted list exists for action verbs.

5.2.7 Control/Display

The task element control/display acted on are 30-character strings. The control/display file is used to verify the value and replaces synonyms and code numbers by their control/display names.

An inverted list exists for controls/displays acted on, and for controls/displays acted on or used in cues.

5.2.8 Comment Classifications

Control/display comment classifications have the format: $b_1 \ldots b_{18}$

if b_1=1, a comment on initiation cue
if b_2=2, a comment on completion cue
if b_3=3, a comment on previous task elements
if b_4=4, a comment on next task elements
if b_5=5, a comment on operator
if b_6=6, a comment on interaction
if b_7=7, a comment on action verb
if b_8=8, a comment on control/display
if b_9=9, a comment on time
if b_{10}=A, a comment on performance limit
if b_{11}=B, a comment on identification
if b_{12}=C, a comment on task element number
if b_{13}=D
if b_{14}=E
if b_{15}=F
if b_{16}=G
if b_{17}=H
if b_{18}=I

} undefined

Otherwise, the corresponding character is blank.

When using comment classification variables in queries and field replacements, b_1 thru b_{18} can be specified in any order and blanks can be omitted.

5.2.9 Comments

Task Element comments are 59-character strings. Associated with each comment is a classification described previously.

5.2.10 Sources

The task element sources are 1-character strings, one for each variable in the record to indicate the source of the data. The following values are permitted:

0 original or revised provided by sponsor

1 changed during encoding

2 not verifiable

6. IMMEDIATE POTENTIALS FOR PROGRAM ENHANCEMENT

From our experience with this system, we have observed several areas where the system could be enhanced. These additional capabilities can be implemented with a minimum of effort.

The computer system's utility for sorting records can be used to sort the lines created by a PRINT-SORTED request. This would yield the following benefits: the lines can be sorted by more than the first four characters, there would be an increase in speed, and possibly less core would be required.

Queries are not permitted across the two files (control/display and task element). Therefore, it is not possible to process queries such as "What are all the task elements that use controls/displays located on a particular panel?" This restriction could be removed.

If additional report capabilities are desired, they may be incorporated in the query subsystem but a special purpose program would be simpler to implement. From the experience gained by the use of the query subsystem, it appears that most requests do not use the boolean relation to limit the retrieval of data. If this is also true for a new report, then there is little advantage in extending the query subsystem.

Behavioral objective numbers or identifications can be added to task element records. This would permit the retrieval of task element variables by knowing the behavioral objective.

EXAMPLE 1

The following pages contain examples of file maintenance operations performed on the control/display file.

FILE MAINTENANCE

*ADD

```
COL        1 1 1 1  2 2 2     3  3 3    4 4  4 4 4 5   5   6    6    7 7  7    8
 1   5     1 3 5 7  0 2 4     0  3 5    0 2  5 7 9 1   6   0    5    0 2  5    0
 102            FIRE DETECTION PANEL              OHD RTCNFIRE DETR
  C0000000000000000000 1                                                1
  FIRE DETR            FIRE DETR PANEL
  2    1     UNIT
          1 CONTROLS AND DISPLAYS FOR FIRE DETECTION
&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&
&&&&                                                                                      &&&&
&&&&                THE PRECEDING ITEM HAS BEEN ADDED TO THE C/D CATALOG;                 &&&&
&&&&                ITS ASSIGNED RECORD NUMBER IS 1921.                                   &&&&
&&&&                                                                                      &&&&
&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&

COL        1 1 1 1  2 2 2     3  3 3    4 4  4 4 4 5   5   6    6    7 7  7    8
 1   5     1 3 5 7  0 2 4     0  3 5    0 2  5 7 9 1   6   0    5    0 2  5    0
 IC20402?X     APU LOOP B LIGHT                    OHD RTCNFIRE DETR            02
  1000000000000000000   ON              OFF               'LOOP B'         1
 L APU LOOP B LIGHT  R APU LOOP B LIGHT
 8    1     TRANS-ILLUMINATED CAUTION LIGHTS ASSOCIATED WITH FIRE DETECTOR
      1     LOOP B IN L AND R APU
          1 ILLUMINATES WHEN RESPECTIVE FIRE DETECTION LOOP DEVELOPS A
          1 SHORT TO GROUND
          1 TRIGGERS FIRE DETR AND MASTER CAUTION SWITCHLIGHTS WHEN
          1 OPERATING ON AC POWER
           1PLACE RESPECTIVE LOOP MODE SWITCH IN POSITION TOWARD NON-
           1ILLUMINATED LOOP A LIGHT
&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&
&&&&                                                                                      &&&&
&&&&                THE PRECEDING ITEM HAS BEEN ADDED TO THE C/D CATALOG;                 &&&&
&&&&                ITS ASSIGNED RECORD NUMBER IS 1922.                                   &&&&
&&&&                                                                                      &&&&
&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&

COL        1 1 1 1  2 2 2     3  3 3    4 4  4 4 4 5   5   6    6    7 7  7    8
 1   5     1 3 5 7  0 2 4     0  3 5    0 2  5 7 9 1   6   0    5    0 2  5    0
 IC20302?X     APU LOOP A LIGHT                    OHD RTCNFIRE DETR            02
  10000000000000000000  ON              OFF               'LOOP A'         1
 L APU LOOP A LIGHT  R APU LOOP A LIGHT
 8    1     TRANS-ILLUMINATED CAUTION LIGHTS ASSOCIATED WITH FIRE DETECTOR LOOP
      1     A IN L AND R APU
```

```
                    I ILLUMINATES WHEN RESPECTIVE FIRE DETECTION LOOP DEVELOPS A SHORT
                    1 TO GROUND
                    1 TRIGGERS FIRE DETR AND MASTER CAUTION SWITCHLIGHTS WHEN
                    1 OPERATING ON AC POWER
                     1PLACE RESPECTIVE LOOP MODE SWITCH IN POSITION TOWARD NON-
                     1ILLUMINATED LOOP B LIGHT
             &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&
             &&&&                                                                                    &&&&
             &&&&              THE PRECEDING ITEM HAS BEEN ADDED TO THE C/D CATALOG;                 &&&&
             &&&&              ITS ASSIGNED RECORD NUMBER IS 1923.                                   &&&&
             &&&&                                                                                    &&&&
             &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&


*REPLACE 10203020X I923
NAME=FIRE PANEL (DETECTOR)
             $$$NEW ENTRY REPLACES APU LOOP A LIGHT
VALUE1=OFF
             $$$NEW ENTRY REPLACES ON
VALUE2=ON
             $$$NEW ENTRY REPLACES OFF

                              CONTROL & DISPLAY CATALOG RECORD NUMBER 1923
CODE#=I0203020X, NAME=FIRE PANEL (DETECTOR), PANEL=OHD, SECTOR=RTCN, UNIT=FIRE DETR, TYPE=10000000000000000000, INTRVL-FLAG=,
VAL-IRR-FLAG=, VALUE1=OFF, VALUE2=ON, VALUE3='LOOP A', VALUE4=, VALUE5=, VALUE6=, VALUE7=, SYNONYM1=L APU LOOP A LIGHT, SYNONYM2=R A
-PU LOOP A LIGHT, SYNONYM3=, C-CLASS1=    1, COMMENT1=TRANS-ILLUMINATED CAUTION LIGHTS ASSOCIATED WITH FIRE DETECTOR LOOP, C-CLASS2=
-    1, COMMENT2=A IN L AND R APU, C-CLASS3=       1, COMMENT3=ILLUMINATES WHEN RESPECTIVE FIRE DETECTION LOOP DEVELOPS A SHORT,
C-CLASS4=       1, COMMENT4=TO GROUND, C-CLASS5=       1, COMMENT5=TRIGGERS FIRE DETR AND MASTER CAUTION SWITCHLIGHTS WHEN,
C-CLASS6=       1, COMMENT6=OPERATING ON AC POWER, C-CLASS7=        1, COMMENT7=PLACE RESPECTIVE LOOP MODE SWITCH IN POSITION TOWARD
- NON-, C-CLASS8=        1, COMMENT8=ILLUMINATED LOOP B LIGHT, C-CLASS9=, COMMENT9=;
             &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&
             &&&&                                                                                    &&&&
             &&&&              THE PRECEDING ITEM HAS BEEN PLACED IN THE C/D CATALOG;                &&&&
             &&&&              ITS ASSIGNED RECORD NUMBER IS 1923.                                   &&&&
             &&&&                                                                                    &&&&
             &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&


*REPLACE I02 1921
CODE#=103
             $$$NEW ENTRY REPLACES 102

                              CONTROL & DISPLAY CATALOG RECORD NUMBER 1921
CODE#=103, NAME=FIRE DETECTION PANEL, PANEL=OHD, SECTOR=RTCN, UNIT=FIRE DETR, TYPE=00000000000000000000, INTRVL-FLAG=, VAL-IRR-FLAG=
-1, VALUE1=, VALUE2=, VALUE3=, VALUE4=, VALUE5=, VALUE6=, VALUE7=, SYNONYM1=FIRE DETR, SYNONYM2=FIRE DETR PANEL, SYNONYM3=,
C-CLASS1=    1, COMMENT1=UNIT, C-CLASS2=       1, COMMENT2=CONTROLS AND DISPLAYS FOR FIRE DETECTION, C-CLASS3=, COMMENT3=, C-CLASS4=
COMMENT4=, C-CLASS5=, COMMENT5=, C-CLASS6=, COMMENT6=, C-CLASS7=, COMMENT7=, C-CLASS8=, COMMENT8=, C-CLASS9=, COMMENT9=;
             &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&
             &&&&                                                                                    &&&&
             &&&&              THE PRECEDING ITEM HAS BEEN PLACED IN THE C/D CATALOG;                &&&&
             &&&&              ITS ASSIGNED RECORD NUMBER IS 1921.                                   &&&&
             &&&&                                                                                    &&&&
             &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&


*DELETE 10203020X 1923

                              CONTROL & DISPLAY CATALOG RECORD NUMBER 1923
```

```
CODE#=I0203020X, NAME=FIRE PANEL (DETECTOR), PANEL=OHD, SECTOR=RTCN, UNIT=FIRE DETR, TYPE=1000000000000000000000, INTRVL-FLAG=,
VAL-IRR-FLAG=, VALUE1=OFF, VALUE2=ON, VALUE3='LOOP A', VALUE4=, VALUE5=, VALUE6=, VALUE7=, SYNONYM1=L APU LOOP A LIGHT, SYNONYM2=R A
-PU LOOP A LIGHT, SYNONYM3=, C-CLASS1=    1, COMMENT1=TRANS-ILLUMINATED CAUTION LIGHTS ASSOCIATED WITH FIRE DETECTOR LOOP, C-CLASS2=
-    1, COMMENT2=A IN L AND R APU, C-CLASS3=        1, COMMENT3=ILLUMINATES WHEN RESPECTIVE FIRE DETECTION LOOP DEVELOPS A SHORT,
C-CLASS4=       1, COMMENT4=TO GROUND, C-CLASS5=       1, COMMENT5=TRIGGERS FIRE DETR AND MASTER CAUTION SWITCHLIGHTS WHEN,
C-CLASS6=       1, COMMENT6=OPERATING ON AC POWER, C-CLASS7=        1, COMMENT7=PLACE RESPECTIVE LOOP MODE SWITCH IN POSITION TOWARD
- NON-, C-CLASS8=         1, COMMENT8=ILLUMINATED LOOP B LIGHT, C-CLASS9=, COMMENT9=;

                    &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&
                    &&&&                                                                                    &&&&
                    &&&&              THE PRECEDING ITEM HAS BEEN REMOVED FROM THE C/D CATALOG.             &&&&
                    &&&&                                                                                    &&&&
                    &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&


*DELETE I0204020X 1922

                                        CONTROL & DISPLAY CATALOG RECORD NUMBER 1922
CODE#=I0204020X, NAME=APU LOOP B LIGHT, PANEL=OHD, SECTOR=RTCN, UNIT=FIRE DETR, TYPE=1000000000000000000000, INTRVL-FLAG=,
VAL-IRR-FLAG=, VALUE1=ON, VALUE2=OFF, VALUE3='LOOP B', VALUE4=, VALUE5=, VALUE6=, VALUE7=, SYNONYM1=L APU LOOP B LIGHT, SYNONYM2=R A
-PU LOOP B LIGHT, SYNONYM3=, C-CLASS1=    1, COMMENT1=TRANS-ILLUMINATED CAUTION LIGHTS ASSOCIATED WITH FIRE DETECTOR, C-CLASS2=     1
COMMENT2=LOOP B IN L AND R APU, C-CLASS3=       1, COMMENT3=ILLUMINATES WHEN RESPECTIVE FIRE DETECTION LOOP DEVELOPS A, C-CLASS4=
-    1, COMMENT4=SHORT TO GROUND, C-CLASS5=       1, COMMENT5=TRIGGERS FIRE DETR AND MASTER CAUTION SWITCHLIGHTS WHEN, C-CLASS6=
-   1, COMMENT6=OPERATING ON AC POWER, C-CLASS7=       1, COMMENT7=PLACE RESPECTIVE LOOP MODE SWITCH IN POSITION TOWARD NON-,
C-CLASS8=         1, COMMENT8=ILLUMINATED LOOP A LIGHT, C-CLASS9=, COMMENT9=;

                    &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&
                    &&&&                                                                                    &&&&
                    &&&&              THE PRECEDING ITEM HAS BEEN REMOVED FROM THE C/D CATALOG.             &&&&
                    &&&&                                                                                    &&&&
                    &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&


*DELETE I03 1921

                                        CONTROL & DISPLAY CATALOG RECORD NUMBER 1921
CODE#=I03, NAME=FIRE DETECTION PANEL, PANEL=OHD, SECTOR=RTCN, UNIT=FIRE DETR, TYPE=0000000000000000000000, INTRVL-FLAG=, VAL-IRR-FLAG=
-1, VALUE1=, VALUE2=, VALUE3=, VALUE4=, VALUE5=, VALUE6=, VALUE7=, SYNONYM1=FIRE DETR, SYNONYM2=FIRE DETR PANEL, SYNONYM3=,
C-CLASS1=    1, COMMENT1=UNIT, C-CLASS2=       1, COMMENT2=CONTROLS AND DISPLAYS FOR FIRE DETECTION, C-CLASS3=, COMMENT3=, C-CLASS4=
COMMENT4=, C-CLASS5=, COMMENT5=, C-CLASS6=, COMMENT6=, C-CLASS7=, COMMENT7=, C-CLASS8=, COMMENT8=, C-CLASS9=, COMMENT9=;

                    &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&
                    &&&&                                                                                    &&&&
                    &&&&              THE PRECEDING ITEM HAS BEEN REMOVED FROM THE C/D CATALOG.             &&&&
                    &&&&                                                                                    &&&&
                    &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&




PROCESSING TERMINATED BY EOF ON INPUT FILE
```

EXAMPLE 2

The following pages contain examples of file maintenance operations performed on the task element file.

```
FILE MAINTENANCE



*DELETE 43.1.6.003.00 1593                                          --- RECORD DELETED SUCCESSFULLY


*DELETE 43.1.6.002.00 1592                                          --- RECORD DELETED SUCCESSFULLY


*DELETE 43.1.6.004.00 1591                                          --- RECORD DELETED SUCCESSFULLY


*ADD

*************************************************************************************************************************
E   4321  1        SELECT SEQUENCE NUMBER CORRESPONDING TO TCM
      1  E04010206                    = TBD                    1 4312  6
    1 1  E04010208                    = TBD                    1 4321  2
     1          SELECTS                2 E04010206                        4
                                         E04010208
 211              WHEN WEAPON DELIVERY SEQUENCE IS COMPLETED,DESIRED SEQUENCE
  11              NUMBER IS DISPLAYED.                                --- RECORD STORED - REC#=1591

*************************************************************************************************************************
E   4321  2        SELECT 'FLY TO'
      1  E04010208                    = TBD                    1 4321  1
    1 2  E04010209                    = TBD                    1 4321  3
        +E04010208                    = TBD
     1           SELECTS               1 E04010209                        2
                  1
 2 1              STEERING SEQUENCE NUMBER CORRESPONDS TO SELECTED POINT
   1              SEQUENCE NUMBER.                                    --- RECORD STORED - REC#=1592

*************************************************************************************************************************
E   4321  3        VERIFY CURRENT STEERING POINT IS THE TCM
      2  E04010301                    = TBD                    1 4321  2
        +E04010207                    = TBD
    1 2  E04010301                    = TBD                    1 4321  4
        +E04010207                    = TBD
     1           VERIFIES              2 E04010301                        2
                                         E04010207
 2 1              STEERING SEQUENCE NUMBER CORRESPONDS TO SELECTED POINT
   1              SEQUENCE NUMBER.                                    --- RECORD STORED - REC#=1593


*REPLACE 43.2.1.002.00 1592
AV=VERIFIES
FIELD REPLACED  -  OLD VALUE:  SELECT
CQ1=E04010208=TBD+E04010209=TBD/                                     X
    E04010206=TBD
FIELD REPLACED  -  OLD VALUE:  FLY TO SELECTED POINT         = TBD   +SEQUENCE NUMBER              = TBD
                                                                    --- RECORD HAS BEEN MODIFIED - KEY DID NOT CHANGE
```

```
*REPLACE 43.2.1.001.00 1591
E#=43.2.1.4
FIELD REPLACED  -  OLD VALUE:  43.2.1.001.00
PE1=
FIELD REPLACED  -  OLD VALUE:  43.1.2.006.00
C.E.R1=2
FIELD REPLACED  -  OLD VALUE:  12
C.E.R2=2
FIELD REPLACED  -  OLD VALUE:  12                    --- RECORD HAS BEEN MODIFIED - KEY CHANGED


*NUM                                                                    1
 43.2.1.000.00    5


   INTERVAL TO BE CHANGED          AT LEVEL        BY

43.2.1.001.00   43.2.4.999.99     TASK             5


REC#  VARIABLE  OLD VALUE       NEW VALUE       MOD#

1593  E#        43.2.1.003.00   43.2.6.003.00     1
1593  NE1.CQ1   43.2.1.004.00   43.2.6.004.00     1
1593  PE1       43.2.1.002.00   43.2.6.002.00     1
1591  E#        43.2.1.004.00   43.2.6.004.00     1
1591  NE1.CQ1   43.2.1.002.00   43.2.6.002.00     1
1592  E#        43.2.1.002.00   43.2.6.002.00     1
1592  NE1.CQ1   43.2.1.003.00   43.2.6.003.00     1
1592  PE1       43.2.1.001.00   43.2.6.001.00     1

RENUMBERING COMPLETED


*NUM                                                                    1
 43.1.0.000.00   -1


   INTERVAL TO BE CHANGED          AT LEVEL        BY

43.2.1.001.00   43.9.9.999.99     FUNCTION        -1
```

REC#	VARIABLE	OLD VALUE	NEW VALUE	MOD#
1593	E#	43.2.6.003.00	43.1.6.003.00	1
1593	NE1.CQ1	43.2.6.004.00	43.1.6.004.00	1
1593	PE1	43.2.6.002.00	43.1.6.002.00	1
1591	E#	43.2.6.004.00	43.1.6.004.00	1
1591	NE1.CQ1	43.2.6.002.00	43.1.6.002.00	1
1592	E#	43.2.6.002.00	43.1.6.002.00	1
1592	NE1.CQ1	43.2.6.003.00	43.1.6.003.00	1
1592	PE1	43.2.6.001.00	43.1.6.001.00	1

RENUMBERING COMPLETED

*DELETE 43.1.6.003.00 1593 --- RECORD DELETED SUCCESSFULLY

*DELETE 43.1.6.002.00 1592 --- RECORD DELETED SUCCESSFULLY

*DELETE 43.1.6.004.00 1591 --- RECORD DELETED SUCCESSFULLY

PROCESSING TERMINATED BY EOF ON INPUT FILE

EXAMPLE 3

The following pages contain examples of queries on the control/display file and task element file.

STORY-BOOK TE WHEN E#=1.1.4.38; THIS A COMMENT FIELD

01.1.4.038.00 C

SET 'EMERG GEN' (EMERGENCY GENERATOR) SWITCH TO 'AUTO'.

CHECKLIST = SEQUENCE

SET EMERGENCY GENERATOR CONTROL SW

EMERGENCY GENERATOR CONTROL SW= AUTO

DETAIL-LIST TE WHEN E#=1.1.4.38;

DETAIL LISTING FOR TASK ELEMENT 01.1.4.038.00 REC#= 46

AV=SET, C.E.R1=, C.E.R2=, C.E.R3=, C.E.R4=, C.E.R5=, C.E.R6=, C.E.R7=, C.E.R8=, C.E.R9=, CD1=EMERGENCY GENERATOR CONTROL SW, CD2=, CD3=, CQ1=EMERGENCY GENERATOR CONTROL SW= AUTO, CQ2=, CQ3=, E.ID=SET 'EMERG GEN' (EMERGENCY GENERATOR) SWITCH TO 'AUTO'., E.R1=, E.R2=, E.R3=, E.R4=, E.R5=, E.R6=, E.R7=, E.R8=, E.R9=, E#=01.1.4.038.00, INTER=, IQ=CHECKLIST = SEQUENCE, NE1.CQ1=01.1.4.039.00, NE1.CQ2=, NE1.CQ3=, NE2.CQ1=, NE2.CQ2=, NE2.CQ3=, NE3.CQ1=, NE3.CQ2=, NE3.CQ3=, OP= 8, PE1=01.1.4.037.00, PE2=, PE3=, S.AV=C, S.CD1=C, S.CD2=, S.CD3=, S.CQ1=0, S.CQ2=, S.CQ3=, S.E.ID=C, S.E.R1=, S.E.R2=, S.E.R3=, S.E.R4=, S.E.R5=, S.E.R6=, S.E.R7=, S.E.R8=, S.E.R9=, S.E#=0, S.INTER=C, S.IQ=0, S.NE1.CQ1=0, S.NE1.CQ2=, S.NE1.CQ3=, S.NE2.CQ1=, S.NE2.CQ2=, S.NE2.CQ3=, S.NE3.CQ1=, S.NE3.CQ2=, S.NE3.CQ3=, S.OP=0, S.PE1=C, S.PE2=, S.PE3=, S.TIME=C, TIME=I;

DETAIL-LIST CD WHEN CODE=EC3060201G1;

CONTROL & DISPLAY CATALOG RECORD NUMBER 326

CODE#=EC3060201G1, NAME=OUTER MARKER LIGHT-PILOT, PANEL=, SECTOR=, UNIT=, TYPE=CIGICCCCCCCCCCCCCC, INTRVL-FLAG=, VAL-IRR-FLAG=, VALUE1=ON, VALUE2=OFF, VALUE3='OUTER MKR', VALUE4=, VALUE5=, VALUE6=, VALUE7=, SYNONYM1=OUTER MKR LIGHT, SYNONYM2=, SYNONYM3=, C-CLASS1= 1. COMMENT1=SIGNAL IS RECEIVED FROM OUTER MARKER BEACON (4-7 MILES FROM END, C-CLASS2= 1, COMMENT2=OF RUNWAY) -LIGHT WILL EXTINGUISH AFTER PASSING THROUGH, C-CLASS3= 1, COMMENT3=RECEPTION ZONE FOR OUTER MARKER BEACON, C-CLASS4= 1, COMMENT4=ADVISORY LEGEND LIGHT-GREEN, C-CLASS5= 1, COMMENT5=LOCATED ON CEN PANEL (UPLF) AND COP PANEL (UPRT), C-CLASS6= 1, COMMENT6=N/A-GLIDE SLOPE INTERCEPT SHOULD NORMALLY OCCUR NEAR OUTER, C-CLASS7= 1, COMMENT7=MARKER, C-CLASS8=, COMMENT8=, C-CLASS9=, COMMENT9=;

```
PRINT E# E.ID ACTION-VERB *ACTION-VERB OP
  WHEN  OPERATOR=B +
   (AV=APPLIES/AV=ASSEMBLES/AV=ATTACHES/AV=CALCULATES/AV=(CHECKS OUT));
```

```
PAGE  1
E#                E.ID                                                ACTION-VERB          *ACTION-VERE    OP

01.3.1.004.00     APPLY POWER SOURCE TO A-V (APU OR EXT. SUPPLY)       APPLY                                B
14.1.2.005.00     COMPUTE AND CHECK LANDING DATA                      CALCULATE                            B D
20.3.5.001.00     ATTACH OXYGEN MASKS                                 ATTACH                               ABCD
```

```
PRINT E#  C&DS C&DS-INT-CUE C&DS-CMP-CUE NEXT-TE# PRE-TE#  WHEN
                                                    C&DS-ALL=E060303;
```

PAGE 1

E#	C&DS	C&DS-INT-CUE	C&DS-CMP-CUE	NEXT-TE#	PRE-TE#
07.1.5.006.00	ENABLE SWITCH RANGE CONTROL	RANGE CURSORS	ENABLE SWITCH RANGE CONTROL	07.1.5.007.00	07.1.5.005.00
07.1.5.007.00	ANTENNA INDICATOR CONTROL	ENABLE SWITCH RANGE CONTROL	AZIMUTH INT CONTROL	07.1.5.008.00	07.1.5.006.00
09.2.1.010.00	ENABLE SWITCH	CRT DISPLAY SURFACE	CRT DISPLAY SURFACE X-HAIR CURSORS	09.2.1.011.00	09.2.1.009.00
09.2.2.003.00	ENABLE SWITCH	ANTENNA TILT INDICATOR	ANTENNA TILT INDICATOR CRT DISPLAY SURFACE	09.2.2.004.00	09.2.2.002.00
09.2.2.004.00	ENABLE SWITCH	RANGE CURSORS	CRT DISPLAY SURFACE RANGE CURSORS	09.2.2.005.00	09.2.2.003.00
09.2.2.006.00	ENABLE SWITCH	CRT DISPLAY SURFACE RANGE CURSORS	RANGE CURSORS	09.2.2.009.00	09.2.2.005.00
09.3.2.012.00	ENABLE SWITCH	CRT DISPLAY SURFACE X-HAIR CURSORS	CRT DISPLAY SURFACE X-HAIR CURSORS	09.3.2.013.00	09.3.2.011.00
10.2.4.002.00	ENABLE SWITCH	ANTENNA TILT INDICATOR	ANTENNA TILT INDICATOR CRT DISPLAY SURFACE		10.2.4.001.00
10.2.4.003.00	ENABLE SWITCH	RANGE CURSORS	CRT DISPLAY SURFACE RANGE CURSORS	10.2.4.004.00	10.2.4.002.00
10.2.4.005.00	ENABLE SWITCH	CRT DISPLAY SURFACE RANGE CURSORS	RANGE CURSORS	10.2.4.006.00	10.2.4.004.00
11.5.2.010.00	ENABLE SWITCH	CRT DISPLAY SURFACE	CRT DISPLAY SURFACE X-HAIR CURSORS	11.5.2.011.00	11.5.2.009.00
11.5.3.002.00	ENABLE SWITCH	ANTENNA TILT INDICATOR	ANTENNA TILT INDICATOR CRT DISPLAY SURFACE	11.5.3.003.00	11.5.3.001.00
11.5.3.003.00	ENABLE SWITCH	RANGE CURSORS	CRT DISPLAY SURFACE RANGE CURSORS	11.5.3.004.00	11.5.3.002.00
11.5.3.005.00	ENABLE SWITCH	CRT DISPLAY SURFACE RANGE CURSORS	RANGE CURSORS	11.5.3.006.00	11.5.3.004.00
12.1.4.013.00	ENABLE SWITCH	CRT DISPLAY SURFACE X-HAIR CURSORS	CRT DISPLAY SURFACE X-HAIR CURSORS	12.1.4.014.00	12.1.4.012.00
14.1.1.016.00	ENABLE SWITCH	X-HAIR CURSORS	CRT DISPLAY SURFACE X-HAIR CURSORS	14.1.1.017.00	14.1.1.015.00
11.5.1.015.00	ENABLE SWITCH	FIDUCIALS	FIDUCIALS	11.5.1.016.00	11.5.1.014.00
11.5.1.017.00	ENABLE SWITCH	FIDUCIALS	FIDUCIALS	11.5.1.018.00	11.5.1.016.00

```
PRINT CODE NAME *FUNCTION *TYPE *VALUES WHEN CODE#>=E03010X08  *
                                        CODE#<=E03010106;

PAGE  1
CODE            NAME                          *FUNCTION   *TYPE       *VALUES

E03010X08       SQUELCH SWITCH                2            1          2
                                                         1   2 POS TOGGLE SWITCH
                                                         2   PERMITS DISABLING OF MAIN RECEIVER SQUELCH
E03010X09       PUSH-SET CHANNEL SELECTOR     234          1          234
                                                         1   PUSHBUTTON CONTROL
                                                         2   FREQUENCIES TO BE STORED ARE SET UP WITH THE MANUAL FREQUENCY CONTROL,
                                                         3   ASSIGNED TO DISPLAYED PRESET CHANNEL NUMBER WHEN PRESET FREQUENCY
                                                         4   CHANGE CONTROL PUSHBUTTON IS PRESSED
E030101         PILOT UHF COMM PANEL                     1
                                                         1   A UNIT CONSISTING OF E3-1.1 THROUGH E3-1.2.9
E03010101       FUNCTION SELECT SW-PILOT      1234567      8          1234567
                                                         1   OFF POSITION TURNS OFF RADIO TRANSMITTER-RECEIVER
                                                         2   MAIN POSITION SELECTS NORMAL OPERATION OF RADIO RECEIVER-TRANSMITTER
                                                         3   BOTH POSITION TURNS ON GUARD RECEIVER IN ADDITION TO NORMAL OPERATION
                                                         4   OF RADIO RECEIVER-TRANSMITTER
                                                         5   ADF POSITION CONNECTS AN EXTERNAL GROUND TO THE ADF FUNCTION CONTROL
                                                         6   WIRE,ACTIVATES ADF EQUIPMENT ASSOCIATED WITH AN-ARC-109. MAIN RECEIVER
                                                         7   IS OPERABLE AND GUARD RECEIVER IS DISABLED
                                                         8   4 POSITION ROTARY SELECTOR SWITCH
E03010102       FREQUENCY SELECT SW-PILOT     23456789     1          23456789
                                                         1   3 POS TOGGLE SWITCH, LOCATED BETWEEN DIGITAL READOUTS
                                                         2   PRESET SETS UP 20 PRESET CHANNELS AS SELECTED BY PRESET CHANNEL
                                                         3   SELECTOR KNOB AND CHANNEL READOUT. MANUAL FREQUENCY SELECTORS ARE NOT
                                                         4   EFFECTIVE
                                                         5   MANUAL POSITION RENDERS MANUAL FREQUENCY SELECTORS EFFECTIVE, RADIO
                                                         6   RECEIVER-TRANSMITTER IS TUNED TO FREQUENCY ON MANUAL DIGITAL READOUT
                                                         7   GUARD POSITION DESIGNATES RADIO RECEIVER-TRANSMITTER IS TUNED TO GUARD
                                                         8   CHANNEL FREQUENCY. BOTH PRESET AND MANUAL FREQUENCY SELECTORS ARE
                                                         9   INEFFECTIVE IN THIS POSITION.
E0301010301     PRESET CHANNEL SELECTOR-PILOT 1234         I          2
                                                         1   SELECTS PRESET CHANNELS - ROTARY KNOB
                                                         2   CHANNEL NUMBERS INCREASE WITH CLOCKWISE ROTATION
                                                         3   USED TO SELECT STORAGE SECTIONS IN SOLID-STATE CORE MEMORY, TRANSFER
                                                         4   STORED INFORMATION TO OUTPUT SWITCHES OF THE CONTROL
E0301010302     PRESET CHANNEL READOUT-PILOT  23           1
                                                         1   DIGITAL READOUT
                                                         2   INDICATES SELECTED PRESET CHANNEL CHOSEN BY PRESET CHANNEL SELECTOR
                                                         3   CONTROL KNOB
E03010104       MANUAL-FREQUENCY SELECTOR-PIL 2            I
                                                         1   FOUR MANUAL THUMBWHEEL SELECTORS
                                                         2   CONTROLS READOUT OF MANUAL CHANNEL READOUT-SELECT ANY OF 3500 CHANNELS
E03010105       MANUAL CHANNEL READOUT-PIL    12           12
                                                         1   DIGITAL READOUT OF CHANNEL SELECTED MANUALLY BY MANUAL FREQUENCY
                                                         2   SELECTOR
E03010106       VOLUME CONTROL-PILOT          12           12         12
                                                         1   ROTARY KNOB CONTROL REDUCES AUDIO LEVEL TO HEADSET BY COUNTERCLOCKWISE
                                                         2   ROTATION
E03010107       TONE CONTROL-PILOT            123          1          23
                                                         1   SPRINGLOADED PUSHBUTTON, CONTROLS TRANSMISSION OF A TONE.
                                                         2   WITH CONTROL PRESSED, TRANSMITTER WILL TRANSMIT A SIGNAL MODULATED AT
                                                         3   1020 HZ.
E03010108       SQUELCH SWITCH-PILOT          2          1          2
                                                         1   2 POS TOGGLE SWITCH
                                                         2   PERMITS DISABLING OF MAIN RECEIVER SQUELCH
```

```
PRINT E# CQ2 CQ3 WHEN CQ2¬=NULL / CQ3¬=NULL;


PAGE  1
E#              CQ2                                                                 CQ3

01.3.1.005.00   LIQUID OXYGEN QUANTITY METER = TBD +OXYGEN TEST
                 PUSHBUTTON = TBD
04.1.2.001.00   CAUTION-WARNING LIGHTS ¬=BLANK
04.2.1.003.00   ENGINE INSTRUMENTS ¬=TBD
12.1.2.005.00   STATION NUMERIC KEYBOARD = '4' /STATION NUMERIC KEYBOARD     STATION NUMERIC KEYBOARD = '7' /STATION NUMERIC KEYBOARD
                 = '5' /STATION NUMERIC KEYBOARD = '6'                       = '8'
12.1.4.008.00   STATION NUMERIC KEYBOARD = '4' /STATION NUMERIC KEYBOARD     STATION NUMERIC KEYBOARD = '7' /STATION NUMERIC KEYBOARD
                 = '5' /STATION NUMERIC KEYBOARD = '6'                       = '8'
20.1.1.001.00   ENGINE START SWITCH 4 = OFF
20.1.1.002.00   R ADS COUPLE SWITCH = DISEN
20.1.1.003.00   R APU MODE SW = START +R APU MODE SW = RUN +R RUN LIGHT
                 = ON - G
20.1.1.004.00   R ECS SUPPLY SW = ECS SPLY
20.1.1.010.00   ENGINE START SWITCH 4 = OFF
20.1.4.002.01   ENGINE LOOP B LIGHT 4 = DN
20.1.4.002.02   APU LOOP B LIGHT = DN
20.2.1.004.00   COPILOTS UHF = ABORTING TAKEOFF
20.2.2.007.00   COPILOTS UHF = ABORTING TAKEOFF
20.2.4.009.00   R AGENT DISCH SWITCH = RES +R RES AGENT DISCHARGE LIGHT
                 = 'RES AGENT DISCH
20.2.5.010.00   ENG BLEED AIR SWITCH 4 = OFF
20.2.5.011.01   PREPARE TO EJECT SWITCHLIGHT = 'PREPARE TO EJEC
20.2.5.011.02   CO-PILOT ICS = 'PREPARE TO EJEC
20.3.5.004.00   CONSOLE = CHECKED
20.3.8.001.00   NORMAL THROTTLE RESET SWITCH-P= DEPRESSED +POWER LEVEL
                 INDICATOR-ENG #4 = TBD
20.3.8.002.00   PIL ALT THROTTLE SWITCH 4 = INC /PIL ALT THROTTLE SWITCH
                 4 = DECR +POWER LEVEL INDICATOR-ENG #4 ¬=TBD
20.4.3.006.00   ENGINE 1 TEMP INDICATOR ¬=TBD /ENG 1 CORE RPM INDICATOR
                 ¬=TBD
20.4.4.008.00   ENGINE 1 TEMP INDICATOR ¬=TBD /ENG 1 CORE RPM INDICATOR
                 ¬=TBD
20.4.5.004.00   #4 THROTTLE LEVER = IDLE
20.4.9.003.00   MASTER CAUTION SWITCHLIGHT-COP= OFF +VIB HIGH
                 ANNUNCIATOR-ENG #4 = OFF
20.5.2.003.00   OIL HOT ANNUNCIATORS = OFF
20.6.1.002.00   #1 GENERATOR MODE SWITCH = RESET-OFF +#1 GENERATOR MODE
                 SWITCH = ON +#1 GENERATOR MODE SWITCH = RESET-OFF
20.6.1.003.00   VOLTAGE-FREQ SELECTOR SWITCH = 1 GEN +VOLTAGE METER =      VOLTAGE-FREQ SELECTOR SWITCH = 1GEN +VOLTAGE METER = TBD
                 TBD +FREQUENCY METER = TBD                                  +FREQUENCY METER = TBD
20.6.2.004.01   #1 GENERATOR MODE SWITCH = RESET-OFF +#1 GENERATOR MODE
                 SWITCH = ON +#1 GENERATOR MODE SWITCH = RESET-OFF
20.6.2.004.02   #2 GENERATOR MODE SWITCH = RESET-OFF +#2 GENERATOR MODE
                 SWITCH = ON +#2 GENERATOR MODE SWITCH = RESET-OFF
20.6.2.006.00   VOLTAGE-FREQ SELECTOR SWITCH = ESNTL BUS +VOLTAGE METER
                 = TBD +FREQUENCY METER = TBD
20.6.3.004.00   GENERATOR MODE SWITCHES = RESET-OFF +GENERATOR MODE
                 SWITCHES = ON +GENERATOR MODE SWITCHES = RESET-OFF
20.6.6.002.00   VOLTAGE-FREQ SELECTOR SWITCH = 1 BUS +VOLTAGE METER
                 ¬=TBD /FREQUENCY METER ¬=TBD
20.7.1.001.00   MASTER CAUTION SWITCHLIGHT-COP= OFF +MASTER CAUTION
                 SWITCHLIGHT-PIL= OFF +HYDRAULIC LIGHT = OFF
20.8.1.002.00   SMCS SWITCH = RESET +SMCS SWITCH = ON +SMCS CAUTION
                 LIGHT = OFF
```

```
PAGE  2
E#                CQ2                                                    CQ3

20.8.2.003.00     PITCH TRIM SWITCH = ALTER +PITCH TRIM SWITCH = NORM
                   +PITCH TRIM CAUTION LIGHT = OFF
20.8.2.004.00     PITCH TRIM SWITCH = ALTER +PITCH TRIM CAUTION LIGHT =
                   OFF
20.8.3.001.00     WING SWEEP HANDLES = TBD +WING SWEEP POSITION INDICATOR
                   = TBD
20.8.4.001.00     WING SWEEP HANDLES = TBD +WING SWEEP POSITION INDICATOR
                   = TBD
20.9.2.002.00     HYDRAULIC PRESSURE INDICATORS ¬=TBD                     HYDRAULIC PRESSURE INDICATORS ¬=TBD
20.9.2.003.00     LANDING GEAR CONTROL PANEL = DOWN
20.9.2.005.00     ALTERNATE LANDING GEA  CONTROL= DN +LEFT GEAR ADVISDRY
                   LIGHT ¬='L' /RIGHT GEAR ADVISORY LIGHT ¬='R'
20.9.2.006.00     NOSE GEAR ADVISDRY LIGHT ¬='NOSE'
20.9.3.001.00     NOSE GEAR ADVISORY LIGHT = 'NDSE' +LEFT GEAR ADVISORY  NDSE GEAR ADVISORY LIGHT ¬='NOSE' +LEFT GEAR ADVISORY
                   LIGHT ¬='L' +RIGHT GEAR ADVISORY LIGHT ¬='R'            LIGHT = 'L' +RIGHT GEAR ADVISORY LIGHT = 'R'
20.9.3.002.00     NOSE GEAR ADVISORY LIGHT = 'NDSE' +LEFT GEAR ADVISORY
                   LIGHT ¬='L' /RIGHT GEAR ADVISORY LIGHT ¬='R'
20.9.3.004.00     ALTERNATE LANDING GEAR CONTROL= DN +LEFT GEAR ADVISDRY
                   LIGHT = 'L' +RIGHT GEAR ADVISORY LIGHT = 'R'
20.9.3.006.00     LEFT GEAR ADVISDRY LIGHT = 'L' +RIGHT GEAR ADVISDRY
                   LIGHT = 'R'
20.9.3.007.00     PRIMARY LANDING GEAR CONTRDL = UP +LEFT GEAR ADVISORY
                   LIGHT ¬=OFF /RIGHT GEAR ADVISORY LIGHT ¬=OFF
20.9.3.009.00     LEFT GEAR ADVISDRY LIGHT = 'L' +RIGHT GEAR ADVISDRY
                   LIGHT = 'R'
20.9.4.001.00     NOSEWHEEL STEERING CAUTION LT ¬='NWS'
20.9.4.002.00     STEER ENGAGE-DISENGAGE SWITCH = ENGAGE +A-V = STEERED
20.9.4.003.00     A-V = DIFF BRAKED +A-V = STOPPED
20.9.4.006.00     READY-NWS ADVISORY LIGHT = OFF +A-V = STOPPED

PRINT-SORTED E.ID E# C&DS WHEN C&DS=(ALTITUDE-ELEVATION SELECTOR);

PAGE  1
E.ID                                                          E#              C&DS

DEPRESS 'ELEV-DALT' PUSHBUTTON TO INITIATE ALTIT CALIBRATION   09.2.2.009.00   ALTITUDE-ELEVATION SELECTOR
DEPRESS 'ELEV-DALT' PUSHBUTTON TO FREEZE ELEVATION READOUT     09.2.2.010.00   ALTITUDE-ELEVATION SELECTOR
DEPRESS 'ELEV-DALT' PUSHBUTTON TO INITIATE ALTIT CALIBRATION   10.2.4.006.00   ALTITUDE-ELEVATION SELECTOR
DEPRESS 'ELEV-DALT' PUSHBUTTON TO FREEZE ELEVATION READOUT     10.2.4.007.00   ALTITUDE-ELEVATION SELECTOR
DEPRESS 'ELEV-DALT' PUSHBUTTON TO INITIATE ALTIT CALIBRATION   11.5.3.006.00   ALTITUDE-ELEVATION SELECTOR
DEPRESS 'ELEV-DALT' PUSHBUTTON TO FREEZE ELEVATION READOUT     11.5.3.007.00   ALTITUDE-ELEVATION SELECTOR
NOTE KALMAN FILTER ACCEPTANCE OF ALTITUDE UPDATE               09.2.2.013.00   ALTITUDE-ELEVATION SELECTOR
NOTE KALMAN FILTER ACCEPTANCE OF ALTITUDE UPDATE               10.2.4.010.00   ALTITUDE-ELEVATION SELECTOR
NOTE KALMAN FILTER ACCEPTANCE OF ALTITUDE UPDATE               11.5.3.010.00   ALTITUDE-ELEVATION SELECTOR

END OF FILE -- PROGRAM TERMINATED
```

EXAMPLE 4

The following pages contain samples of the output from the Control/Display Task Element Cross Reference program (in both formats).

CODE	NAME	TASK ELEMENT REFERENCES
C0108	GALLEY LIGHT	NOT REFERENCED
C0109	TOILET LIGHT	NOT REFERENCED
C0110	CREW ENTRY LIGHT SWITCH	NOT REFERENCED
C020X	MASTER AUDIO CUTOUT CONTROL	NOT REFERENCED
C0261	MASTER AUDIO CUTOUT CONTROL-P	NOT REFERENCED
C0262	MASTER AUDIO CUTOUT CONTROL-CP	NOT REFERENCED
C0301	OXYGEN PANEL	NOT REFERENCED
C030101	LIQUID OXYGEN QUANTITY METER	01.1.5.038.00 01.3.1.005.00 06.2.1.007.00
C030102	OXYGEN TEST PUSHBUTTON	01.1.5.036.00 01.3.1.005.00
C0302	EMERGENCY OXYGEN CONTROL	NOT REFERENCED
C0303	OXYGEN INDICATOR	NOT REFERENCED
C030301	OXYGEN LOW CAUTION LIGHT	NOT REFERENCED
C030401	OXYGEN FLOW SHUTOFF TOGGLE VLV	NOT REFERENCED
C030402OX	EMERGENCY OXYGEN PRESS GAGE	NOT REFERENCED
C03040201	EMERG OXYGEN PRESS-FIXED SCALE	NOT REFERENCED
C03040202	EMERG OXYGEN-MOVING SCALE	NOT REFERENCED
C030403OX	DILUTER-PRESSURE DEMAND REGS	01.1.4.008.00
C03040301	DILUTER-PRESSURE DEMAND-PIL	NOT REFERENCED
C03040302	DILUTER-PRESSURE DEMAND-CDP	20.3.1.001.02
C03040303	DILUTER-PRESSURE DEMAND-DSD	20.3.1.001.04
C03040304	DILUTER-PRESSURE DEMAND-DSG	20.3.1.001.03
C030404	OXYGEN EXTENSION HOSE	NOT REFERENCED
C040101X	WINDSCREEN	01.1.5.040.00 20.1.1.011.00 20.1.1.001.00 16.4.1.001.02 20.9.2.003.00
C040101	WINDSHIELD - LEFT	01.1.5.004.00 01.1.5.005.00 15.4.1.002.00
C040102	WINDSHIELD - RIGHT	NOT REFERENCED
C04020X	SIDE WINDOWS	16.4.1.001.02
C040201	SIDE WINDOW - LEFT	15.4.1.002.00
C040202	SIDE WINDOW - RIGHT	NOT REFERENCED
C04030X	UPPER WINDOWS	16.4.1.001.02
C040301	UPPER WINDOW - LEFT	NOT REFERENCED
C040302	UPPER WINDOW - RIGHT	NOT REFERENCED
C040403X	FLASHBLINDNESS WINDOWS	03.2.3.003.00 04.2.1.001.00 11.3.1.005.00 15.3.2.003.00 11.3.2.007.00
C040401	FLASHBLINDNESS WINDOW-LEFT	03.2.1.007.00 07.2.1.007.00 07.2.1.008.00 07.2.1.012.00 07.2.2.003.00 07.2.2.005.00 07.2.2.017.00 07.3.1.001.00 07.3.1.002.00 07.3.2.001.00 07.4.1.001.00 07.4.1.008.00 07.4.2.003.00 07.4.2.004.00 11.1.3.010.00 11.2.2.004.00 11.3.1.004.00 11.3.1.009.00 15.3.2.002.00 15.4.3.006.00 07.2.2.010.00 07.2.2.016.00 07.3.2.004.00 11.3.2.006.00 11.3.2.011.00
C040402	FLASHBLINDNESS WINDOW-RIGHT	07.2.1.007.00 07.2.1.008.00 07.2.1.012.00 07.4.1.007.00 11.1.3.010.00 11.2.2.004.00 15.2.1.001.00
C040403	FLASHBLIND-LF SIDE WINDOW	03.2.1.007.00
C040404	FLASHBLIND-RT SIDE WINDOW	NOT REFERENCED
C040405	FLASHBLIND-UP LF WINDOW	NOT REFERENCED
C040406	FLASHBLIND-UP RT WINDOW	NOT REFERENCED
C05	SEATS	01.1.5.010.00
C0501	PILOT SEAT	NOT REFERENCED
C050101	PILOT ARMREST ADJUST CONTROL	NOT REFERENCED
C050102	PILOT VERTICAL ADJUST SWITCH	NOT REFERENCED
C050103	PILOT FORE-AFT ADJUST CONTROL	NOT REFERENCED
C050104	PILOT TILT ADJUST CONTROL	NOT REFERENCED
C0502	COPILOT SEAT	NOT REFERENCED
C050201	COPILOT ARMREST ADJUST CONTROL	NOT REFERENCED
C050202	COPILOT VERTICAL ADJUST SW	NOT REFERENCED

NAME	CODE	TASK ELEMENT REFERENCES
#4 BYPASS BUZZ LEGEND LIGHT	A0103040102	NOT REFERENCED
#4 BYPASS CRIT LEGEND LIGHT	A0103040101	NOT REFERENCED
#4 ENG OIL PRESS CAUTION LIGHT	J01070401	NOT REFERENCED
#4 ENG PWR LEVEL OFF IND	J01010401	NOT REFERENCED
#4 ENGINE BLEED AIR SWITCH	N010104	NOT REFERENCED
#4 ENGINE FIRE SWITCHLIGHT	R010104	NOT REFERENCED
#4 ENGINE OFF TAPE MARKER	J01060401	NOT REFERENCED
#4 ENGINE TAPE	J010604	NOT REFERENCED
#4 FAN RPM CAUTION LIGHT	J01020401	NOT REFERENCED
#4 FAN RPM INDICATOR	J010204	NOT REFERENCED
#4 FAN RPM WARNING LIGHT	J01020402	NOT REFERENCED
#4 FF WARNING SIGNAL	J01040401	NOT REFERENCED
#4 FILL VALVE SWITCH	U010207	NOT REFERENCED
#4 HYD PRESSURE INDICATOR	H010204	NOT REFERENCED
#4 HYD QUANTITY INDICATOR	H010104	NOT REFERENCED
#4 LOOP A LIGHT	R02030104	NOT REFERENCED
#4 LOOP B LIGHT	R02040104	NOT REFERENCED
#4 LOOP LOCKOUT SWITCH	R020104	NOT REFERENCED
#4 OIL HOT ANNUNCIATOR	J080204	NOT REFERENCED
#4 OIL PRESS INDICATOR TAPE	J010704	NOT REFERENCED
#4 OIL PRESS OFF MARKER	J01070402	NOT REFERENCED
#4 OIL QUANT OFF TAPE MARKER	J01080401	NOT REFERENCED
#4 OIL QUANTITY TAPE INDICATOR	J010804	NOT REFERENCED
#4 TANK TRANSFER SWITCH	U010408	NOT REFERENCED
#4 THROTTLE LEVER	J030104	NOT REFERENCED
#4 THROTTLE LEVER	J030204	NOT REFERENCED
'DIS MODE' SWITCH	B010105	NOT REFERENCED
A-S (AIRSPEED HOLD) PUSHBUTTON	S03010X05	NOT REFERENCED
A-V	Q85	04.1.2.001.00 04.2.5.004.00 04.2.4.002.00 14.1.2.020.00 15.2.1.002.00
		15.3.1.002.00 15.3.2.003.00 15.4.5.001.00 15.4.5.002.00 04.1.2.002.00
A-V ACCESS DOORS AND COVERS	Q75	01.1.1.001.00 16.1.1.001.01 16.1.1.001.02
A-V AFT INTMD FUSELAGE EXTER	Q111	01.1.2.003.00
A-V CREW MODULE	Q11	16.4.1.011.00
A-V CREW MODULE ENTRY	Q04	02.1.2.001.00 02.1.2.002.00
A-V CREW STATIONS	Q89	02.1.1.002.00 02.1.1.005.00
A-V ENGINE AIR INLET DUCTS	Q109	01.2.1.039.00 01.2.1.040.00
A-V ENGINE EXHAUST DUCTS	Q108	16.4.1.009.00 16.4.1.010.00
A-V ENTRY LADDER	Q08	16.4.1.007.00 16.4.1.008.00
A-V ENTRYWAY EQUIPMENT	Q104	02.1.1.005.00 02.1.2.001.00
A-V EXTERIOR	Q52	16.4.1.004.00 16.4.1.011.00
A-V EXTERIOR INSPECTION ROUTE	Q86	01.3.1.001.03 01.3.1.002.00
A-V FORWARD FUSELAGE	Q102	01.1.2.001.00
A-V FWD & ITMD FUS & WPNS BAYS	Q105	16.4.1.002.00 16.4.1.005.00
A-V FWD & ITMD FUS & WPNS BAYS	Q114	16.4.1.005.00 16.4.1.006.00
A-V GROUNDING CABLES	Q101	16.4.1.005.00 16.4.1.006.00
A-V L & R NACELLES EXTERIOR	Q112	16.3.2.005.00
A-V L & R WG CARRY THRU & WGS	Q113	16.4.1.008.00 16.4.1.009.00
A-V L&R NACELLES EXTERIOR	Q106	16.4.1.006.00 16.4.1.007.00
A-V L&R WG CARRY THRU & WGS	Q107	NOT REFERENCED
A-V MAIN LANDING GEAR	Q110	NOT REFERENCED
A-V NOSE	Q03	16.4.1.010.00
A-V NOSE LDG GEAR & EQUIPMENT	Q103	02.1.1.001.00
		16.4.1.003.00

APPENDIX A

This appendix outlines the procedures involved in the translation of verbal descriptions of controls and displays into the format required by encoding forms represented in Figure A-1. Several arbitrary conventions, which have been adapted to ensure uniformity of encoding, have been included. The numbered topics represent the major categories of information about a particular control or display. They correspond to the encircled numbers on Figure A.1.

1. CODE - The code is an alphanumeric identifier unique to the particular control or display. It consists of a letter which identifies the major functional subsystem, followed by a maximum of 6 sets of 1 or 2 digits. The codes supplied in the human engineering data separate the sets of digits with periods. For purposes of encoding, the periods are omitted and leading zeros are embedded to ensure sets of 2 digits.

Examples:

Human Engineering Code	Translated Code
R1-2.1	R010201*
F1-3.1.15	F01030115*
D10-1.2.1	D10010201*

In some situations, it was found desirable to encode several controls or displays together. For example, there may be 4 annunciators with identical function, operation and description except that each refers to a different engine. If it was determined that in the task analysis data, these 4 annunciators were always or often to be referred to together they were encoded as a single control/display. The encoding is only possible if the codes for these individual items differ only in one digit set. On the encoding sheet, an X is entered in the position where the codes differ. For example:

F1-1.1
F1-1.2
F1-1.3
F1-1.4 } May be combined as F1-1.X,

where the X represents the fact that the codes differ only in the last digit. F1-1.X translates to the F01010X when encoded. If any one of the components is to be utilized separately, it should be encoded separately as well.

---

* Not all codes require 6 sets of digits. Those that require fewer digits have blanks in the unused trailing digits.

2. NAME - The name is a 30 character (maximum) unabbreviated identification extracted from either

- The Control/Display Verbal Descriptions (Human Engineering Data, from Rockwell)
- Alphanumeric Identification of B-1 Flt. Sta. Displays & Controls (TDF 73-1618)

The former of these was used to encode some of the controls/displays. The latter, however, is more recent and should be given preference.

If the name is more than 30 characters, an abbreviation is constructed. The name is left-justified within the 30 character field.

3. PANEL - The cockpit of the B-1 is divided formally into panels. With the exception of a few, each control or display is located on one of these panels. An abbreviation for the panel on which the control or display is located is entered, left-justified within this field. The abbreviations are as follows:

PIL	Pilot's Panel	RCN	Right Console
COP	Copilot's Panel	LRCN*	Left and Right Consoles
PCP*	Pilot and Copilot Panels	OHD	Overhead Panel
CEN	Center Instrument Panel	OSO	OSO Panel
CPD	Center Pedestal	DSO	DSO Panel
LCN	Left Console	D+O*	DSO + OSO Panels

4. SECTOR - For purposes of location, most panels are divided arbitrarily into 9 sectors. Sector categorization is always made with reference to the PANEL (item #3), since alone the sector information is virtually useless. Considered together, PANEL and SECTOR are sufficient for purposes of location of a control or display. Some panels, because of their unusual shapes, are not divided into 9 sectors.

UPLF	UPCN	UPRT
LFCN	CEN	RTCN
LOLF	LOCN	LORT

* Occassionally two controls or displays are grouped together (using X notation defined in (1) and are located on different panels.

5. UNIT - This category identifies the physical or functional combination of controls and displays to which the control or display belongs.

Example:

J1-9, ENG legend light is located on the Flight Station Caution Panel, which is located on the center instrument panel, lower center.

Encoding Variables:

PANEL: CEN
SECTOR: LOCN
UNIT: FLT STA CAUTION PNL*

6. #COMP - Number of Components pertains only to the situation referred to in 1 above, in which several controls or displays are encoded together and the X notation is used. This variable is an integer index for X, that is, the combination of controls or displays ranges in codes from 1 to #COMP.

Example:

If the code is R02010X and #Comp is 4, then the controls or displays represented by the code are:

R020101
R020102
R020103
R020104

7. TYPE - Type refers to the physical properties of the control or display. This capability provides for searching any combination of 20 user-defined categories. Current categories include:

CAUTION	EMERGENCY	UNIQUE (to B-1)
WARNING	LEVER-LOCK	
ADVISORY	GUARDED	

---

* An abbreviation is arbitrarily constructed in order to conform to the 20-character length constraint. All occurrences of an abbreviation must be identical, including spacing, to ensure successful searching on the UNIT.

A 1 in the appropriate column indicates membership in the defined category.

Column 22, Continuous: a 1 in this column indicates that the control or display is continuous as opposed to discrete. For example, a dial with a needle is continuous whereas a switch with two positions is not.

Column 23, Irrelevant: a 1 in this column indicates that the values associated with this particular control or display on task element data sheets will not be verified. Ordinarily values associated with controls or displays on the task element data sheets are checked against those in the control display data base during verification of the data.

Column 72, Values: a 1 in this column indicates that more than 3 Value fields (see #8 below) are necessary for the control or display. The maximum is 7. An appropriate situation would be if a switch has 5 positions.

If more than 7 values are necessary, then the irrelevant column should be coded as 1, so that legal values, other than the 7 allowable, are not rejected. For informational purposes, the user can construct a classified comment (see #10 below) in which the additional values are entered.

8. VALUES - The values are the states associated with a control or display. For example, a 2-position toggle switch may have as states ON and OFF. In this case, ON and OFF are the values associated with this control or display. The value length is 16 characters.

There are two different situations for encoding of values, corresponding to the continuous or discrete categorization of controls and displays (see #7 above, column 22, continuous). If the control or display is continuous, the first 2 value fields are interpreted as a numerical range for the values of the control or display. Consequently, the first two values must be numbers (integers or real numbers) and they must be right justified within the value field.

Example:

If column 22=1 and the first two value fields are 0 and 10, then any value between 0 and 10 is a legal value.

If the control or display is discrete, values are alphanumeric entities, left-justified in the field with the following conventions:

1. When a control or display has a readable legend, values include ON, OFF, '(LEGEND)'. Quotation marks indicate a readable legend or flag. If the legend has more than 14 character (16-2 quotes), as many as possible are included within the 16 character field. For example, if a legend indicator reads CREW COMPT AVIONICS HOT the values would be:

   ON
   OFF
   'CREW COMPT AVIO'*

   A classified comment (see #10 below) may be constructed in order to show the entire legend.

2. Values for a flag with a legend are at minimum:

   NO FLAG, '(LEGEND)'

3. Lights without legends have as values, ON, OFF (COLOR) (when appropriate).

4. There is a set of legend indicators that illuminate in two or more colors. Values for these indicators are '(LEGEND)' -C, where C is the first letter of the color.

The above-stated conventions for the encoding of values have been utilized in the initial encoding of the flight station controls and displays. Encoding procedures and conventions are arbitrary and may be modified to fulfill the needs of the user. A general guideline for encoding of values is the document TFD-73-1618 entitled Alpha-Numeric Identification of B-1 Flight Station Displays and Controls, which lists values for many controls and displays.

9. SYNONYMS - The existence of synonyms must be preceded by a 1 in column 73 of the 2nd card of the record. This 'flag' notifies the program to expect a Synonym card to follow. If the 'flag' is not set, the program expects to find either a value card (if column 72 is so encoded) or the first classified comment.

Synonyms are alternate identifiers of a control or display. A maximum of 3 synonyms of at most 20 characters is allowed per control or display. This space is ordinarily used for often-used abbreviation. Synonyms should be left-justified within the field.

---

* Note that the trailing quote is one of the missing characters.

10. CLASSIFIED COMMENTS: The purpose of classified comments is to encode additional information about the control or display which does not fit into the format of the other items on the form. There are 9 classifications, any combination of which may be utilized when appropriate.

Classifications are:

CODE	VALUES
NAME	SYN
LOCATION	FUNCTION
UNIT	CORRECTIVE ACTION
TYPE	

The classified comments represent ancillary information about CODE, NAME, LOCATION, UNIT, TYPE, VALUES, and SYN, as well as primary information relating to FUNCTION and CORRECTIVE ACTION. Corrective Action ordinarily refers to the action that should be taken when a legend indicator illuminates.

Additional Conventions:

1. For Values on dials, the UNITS (e.g. Hz,Kg) are ignored.

2. Values are to represent as closely as possible what is visible within the flight station. For example, labels of switch positions are to correspond to the abbreviation that is visible to the crew member.

3. Zeros (number) = 0
   O (letter) = Ø

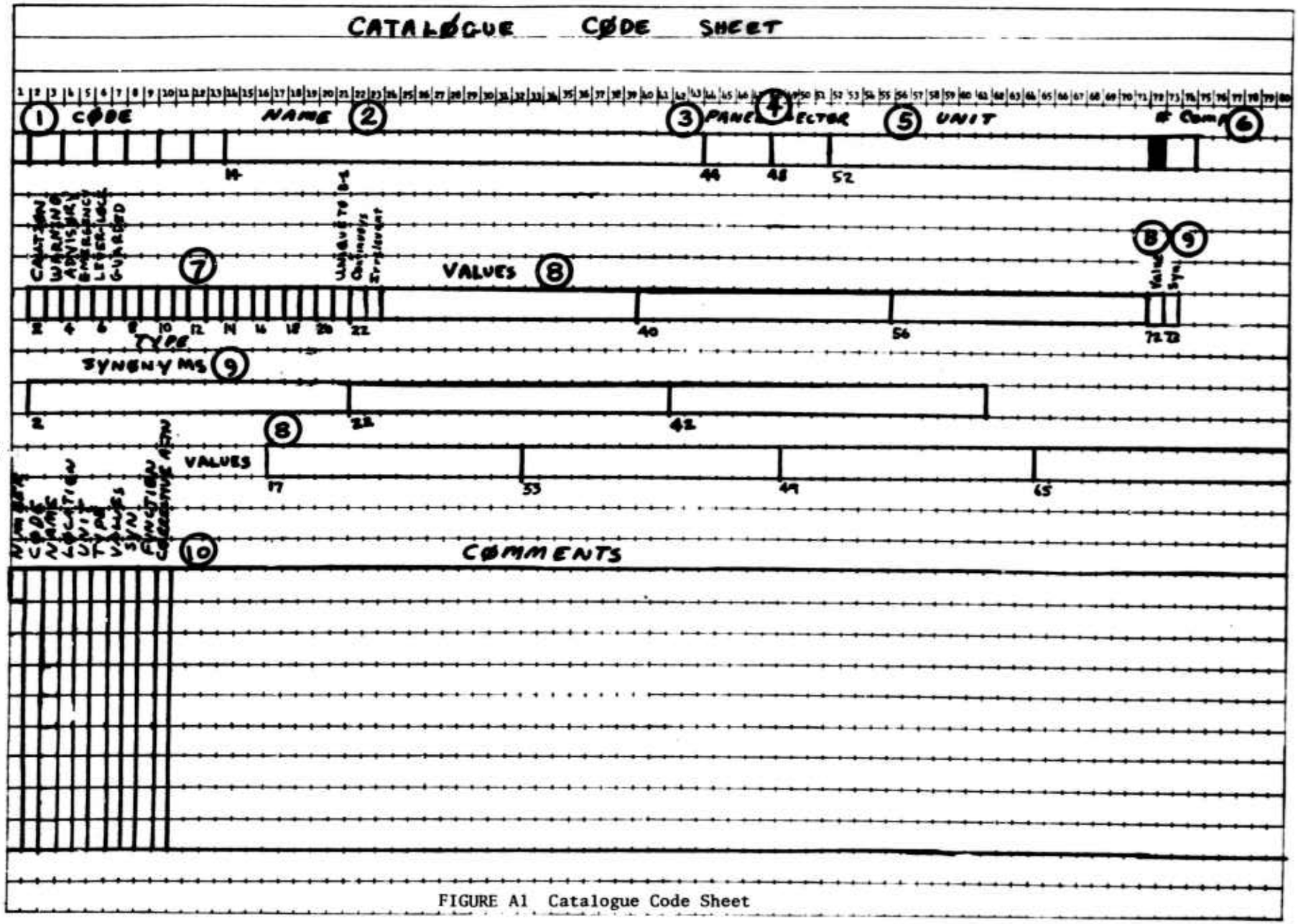

FIGURE A1 Catalogue Code Sheet

Figure A.2 is a control/display verbal description of human engineering data, extracted from the document provided by the sponsor containing functional descriptions of the B-1 Avionics-Offensive System. It represents a typical description from which a Catalogue Code Sheet is encoded. Figure A.3 represents the encoded Catalogue Code Sheet for which the information from the extract in Figure A.2 was used. The two figures represent the translation of the verbal description into the format of the Catalogue Code Sheet, which is then keypunched to become part of the Control/Display data base.

Figure A.4 through A.6 are referred to in sections 1, 3 and 5.

ENCODING EXAMPLE

W8 - Stores Delivery Panel

W8-6.6 AWAY

This indicator illuminates whenever any scheduled weapon is released and physically separated from the weapon carriage rack. It remains lit for five seconds after separation and then deactivates. Should multiple releases be scheduled, the indicator lights with the first separation, and pulses four (4) times per second until the multiple separations are complete. Upon completion, the light stays lit in a steady state for five seconds, and then deactivates. This indicator is green.

FIGURE A.2

CONTROL/DISPLAY DESCRIPTION
EXAMPLE

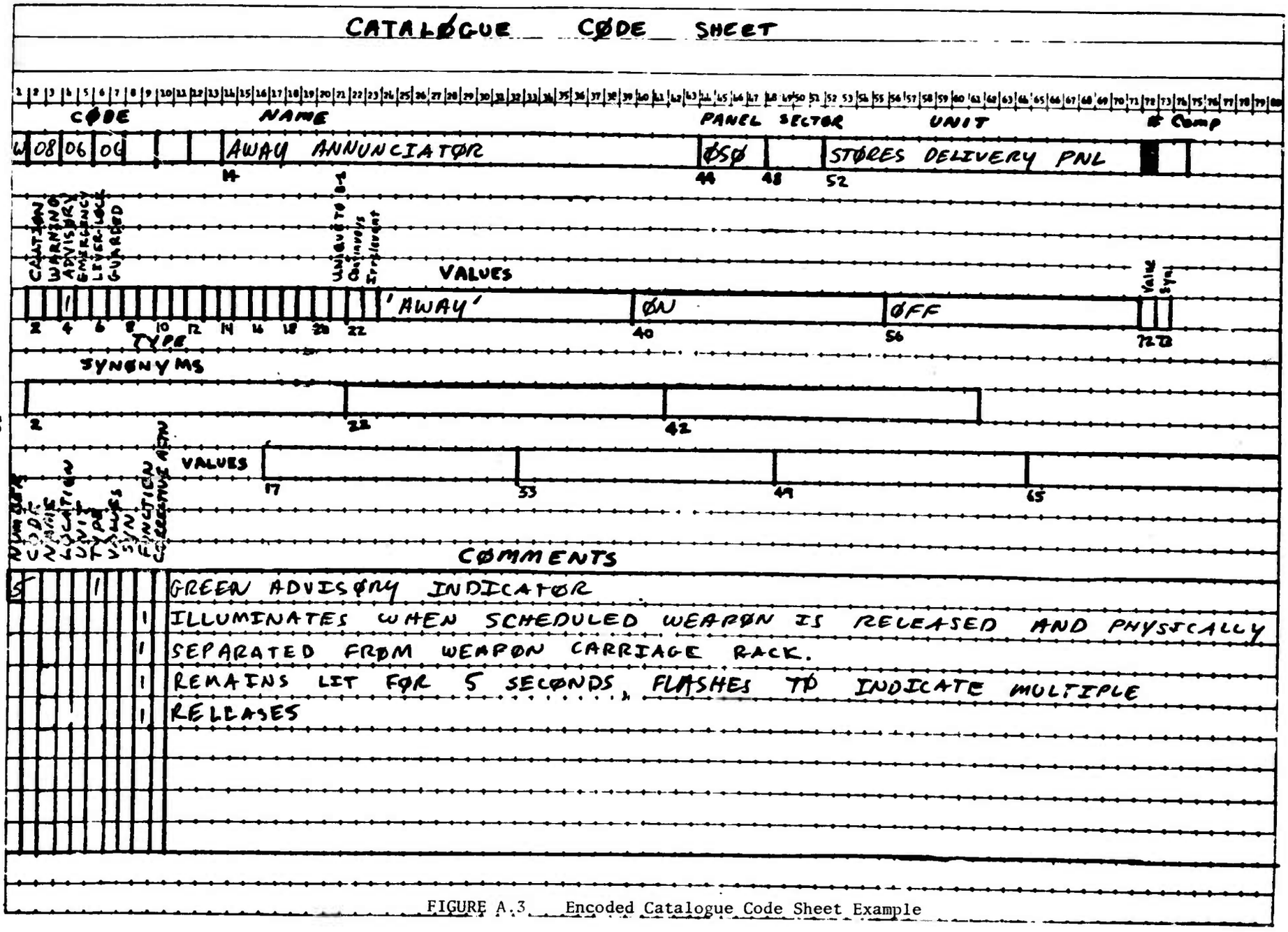

FIGURE A.3 Encoded Catalogue Code Sheet Example

FIGURE A.4

B A S I C V A R I A B L E S - CONTROL/DISPLAY RECORDS	
VARIABLE	D E S C R I P T I O N
C-CLASS1	CLASSIFICATION OF REMARK 1
C-CLASS2	CLASSIFICATION OF REMARK 2
C-CLASS3	CLASSIFICATION OF REMARK 3
C-CLASS4	CLASSIFICATION OF REMARK 4
C-CLASS5	CLASSIFICATION OF REMARK 5
C-CLASS6	CLASSIFICATION OF REMARK 6
C-CLASS7	CLASSIFICATION OF REMARK 7
C-CLASS8	CLASSIFICATION OF REMARK 8
C-CLASS9	CLASSIFICATION OF REMARK 9
CODE#	CONTROL/DISPLAY CODE NUMBER
COMMENT1	CONTROL/DISPLAY REMARK 1
COMMENT2	CONTROL/DISPLAY REMARK 2
COMMENT3	CONTROL/DISPLAY REMARK 3
COMMENT4	CONTROL/DISPLAY REMARK 4
COMMENT5	CONTROL/DISPLAY REMARK 5
COMMENT6	CONTROL/DISPLAY REMARK 6
COMMENT7	CONTROL/DISPLAY REMARK 7
COMMENT8	CONTROL/DISPLAY REMARK 8
COMMENT9	CONTROL/DISPLAY REMARK 9
INTRVL-FLAG	FIRST 2 VALUES CORRESPOND TO A LOWER-UPPER RANGE OF VALUES FOR THIS CONTROL/DISPLAY WHEN FLAG = 1 ELSE FLAG = BLANK
NAME	NAME OF CONTROL/DISPLAY
PANEL	PANEL LOCATION OF CONTROL/DISPLAY
SECTION	SECTION LOCATION OF CONTROL/DISPLAY
SYNONYM1	SYNONYM FOR CONTROL/DISPLAY
SYNONYM2	.
SYNONYM3	.
TYPE	TYPE OF CONTROL/DISPLAY
UNIT	UNIT LOCATION OF CONTROL/DISPLAY
VAL-IRR-FLAG	DO NOT VERIFY CONTROL/DISPLAY VALUES USED IN TASK ELEMENT CUES WHEN FLAG=1 ELSE FLAG=BLANK
VALUE1	POSSIBLE VALUE FOR CONTROL/DISPLAY
VALUE2	.
VALUE3	.
VALUE4	.
VALUE5	.
VALUE6	.
VALUE7	.

FIGURE A.5

S Y N O N Y M S - CONTROL/DISPLAY RECORDS

VARIABLE	D E S C R I P T I O N
CODE	CONTROL/DISPLAY CODE NUMBER
CD#	CONTROL/DISPLAY CODE NUMBER
SYN1	CONTROL/DISPLAY SYNONYM 1
SYN2	CONTROL/DISPLAY SYNONYM 2
SYN3	CONTROL/DISPLAY SYNONYM 3
SYSTEM	SYSTEM LOCATION (FIRST LETTER OF CODE NUMBER)

FIGURE A.6

GROUPS - CONTROL/DISPLAY RECORDS

VARIABLE	DESCRIPTION
LOCATION	PANEL, SECTOR, UNIT
LOCATIONS	PANEL, SECTOR, UNIT
SYN	SYNONYMS 1-3
SYN-NAME	SYNONYMS 1-3 PLUS NAME
SYNONYM	SYNONYMS 1-3
SYNONYMS	SYNONYMS 1-3
SYNS	SYNONYMS 1-3
VALU	VALUES 1-7
VALUE	VALUES 1-7
VALUES	VALUES 1-7

FIGURE A.7

CLASSIFIED COMMENTS - CONTROL/DISPLAY RECORD

VARIABLE	DESCRIPTION
*CODE	CODE COMMENTS
*CORR-ACTION	CORRECTIVE ACTION COMMENTS
*FUNCTION	FUNCTION COMMENTS
*LOCATION	LOCATION COMMENTS
*NAME	NAME COMMENTS
*SYN	SYNONYM COMMENTS
*SYNONYMS	SYNONYM COMMENTS
*TYPE	TYPE COMMENTS
*UNIT	UNIT COMMENTS
*VALUES	VALUE COMMENTS

APPENDIX B

This appendix outlines the form of the task analysis data and the encoding procedures and conventions by which the task analysis data are translated into the formats required by the Task Element Worksheet. This worksheet is reproduced in Figures B.1 and B.2.

The task analysis data, as provided by the sponsor, form hierarchical combinations of simple actions. Specifically, mission segments are composed of functions, which are composed of task elements. Task elements occassionally are composed of sub-task elements. The hierarchy is schematized in Figure B.3.

For current use, the smallest unit of behavior, the task element or sub-task element, is used for encoding. The format of the task element corresponds to the stimulus-response characteristics of the activity.

The major components that characterize the behavioral aspect of a task element are as follows:

Initiation Cue -- Action Verb -- Control -- Completion Cue.

The Initiation Cue is the stimulus complex that informs the operator to begin the activity. The initiation cue consists of a boolean combination of relational statements. The relational statements involve a stimulus "source" (e.g., "ON", 3000, "RED"). An example of an initiation cue is: Altimeter - greater than - 10,000 feet and Mach indicator - equals - 1.7 mach. The necessity for a boolean combination results from the fact that some initiation cues consist of various situations, any of which could be met ("OR" statement), or all of which must be met ("AND" statement). The controls and displays are elements of a catalog. The catalog is used for verification of the data as the task analysis information is entered into storage. This verification allows keypunch errors to be detected as well as checking that the value assigned is appropriate for that control or display.

The Action Verb is selected from a standardized vocabulary of terms (e.g., pull, rotate, and align) that was developed for the B-1 SAT. The action verb has a correspondence to the control that is operated upon.

The next component of the task description is the Control. This is the grammatical direct object of the Action Verb. These controls are a subset of the entries in the Control/Display Catalog. It should be noted that it is sometimes the case that a "display" can be operated upon (e.g., monitor the altimeter) and, therefore, becomes the "control".

The Completion Cue is of the same form as the Initiation Cue. In fact, it is often the case that the Completion Cue of one task element is the Initiation Cue of the next task element. As with the Initiation Cue, the Completion Cues are boolean combinations of relational statements. However, in the former

case, there is only one conglomerate cue, whereas, in the latter case there are often two or more conglomerate cues, each of which leads to a different next task element. For example, when a decision is made by a crew member, two alternative actions (next task elements) might be possible, depending upon the information upon which the decision was based. A more common situation is the case where one completion cue represents the normal operation and the other completion cues represent corrective actions.

Figure B.4 is an extract of a task element from the task analysis data sheets provided by the sponsor. Figures B.5 and B.6 represent the encoded task element worksheet (front and back, respectively) represented in Figure B.4. These figures show that the raw task analysis data exist in a form amenable for translation onto encoding forms. Specifically, the Task Description is transferred verbatim into the identification. The initiation and completion cues exist and need not be constructed. The main point is that the format of the encoding form is derived from the form of the task analysis data, and consequently, no major manipulations of the data are required.

The following sections outline the encoding conventions for the Task Element worksheet. The section numbers correspond to those encircled on the form in Figures B.1 and B.2.

1. Task Element Number - this number is the code that identifies the task element. On the task data sheets, this number is referred to as 'Crew Task Element No.' It consists of 6 fields followed by a source block, labelled S. Left to right, the fields represent the mission segment, function, task, task element, and sub-task element numbers. The length of the fields have been determined so that the requirements of the data base are satisfied. For example, mission segment is a two-digit number, which yields a capability for handling 99 mission segments. Similarly, within a task, there is space enough to encode 999 task elements.

   Within each field, the number is right-justified when the number to be entered has fewer digits than the field allows.

   Example:

   Task Element 8.1.2.1 which can be interpreted as follows:

   Mission Segment: 8
   Function: 1
   Task: 2
   Task Element: 1

   is encoded to read 8 1 2 1

   Currently, the operator field is left blank since operator information is available elsewhere on the form (see #11).

2. ID - This field (60 characters) is for a verbal description of the task element. This information corresponds to that labelled Task Description on the Task Analysis Task Data Sheet. There are no restrictions other than the 60-character limit as to what type of information is encoded in the ID field.

3. Source Boxes - Associated with each of the entries on the Task Element Worksheet is a single character field identified by 'S'. The purpose of this character is to identify the source of the information in the immediately preceding field. In most instances, this field is blank, indicating that the data are the original or revised task analysis data provided by the sponsor. Possible values are:

   0 original or revised provided by sponsor
   1 changed during encoding
   2 not verifiable

4. Initiation Cue - An initiation cue consists of a maximum of 3 clauses, each of which has as components a control or display, a relational operator, and a value associated with the control or display. Preceding the first clause is a single character field labelled 'T' into which the total number of clauses utilized is entered (0,1,2,3). If 2 or 3 clauses are utilized, a boolean operator is required in the single character field to the immediate left of the control/display field of the appropriate clause. If one clause is utilized, no boolean operator is necessary. Boolean operators are + (and) and / (or).

5. Completion Cues - The completion cues are identical in format to the initiation cue with the exception of an additional T box and the capability for using more than one completion cue.

   With reference to Figure B.1, it can be seen that there are 3 possible completion cues, each of which corresponds in form to the initiation cue discussed above in number (4). The primary or top-most completion cue has an additional T block to the left of the T block referring to it. This left T block identifies the number of clauses used within the cue.

6. Control/Display Fields - As mentioned in 4 and 5 above, a clause of an initiation or completion cue consists of a control/display field, a relational operator, and a value. Control/display fields are also used in the action sequence, referred to by number 11. For each instance of a control/display field, the encoding conventions are identical. Permissible in any of these fields are:

   1. A control/display identification identical in form to one in the control/display catalogue.

   2. A control/display name (30 character identification)

   3. A control/display synonym (20 character).

These alphanumeric identifiers must be identical, including spacing, to the control/display catalogue entity used. Abbreviations different from those used in the control/display catalogue are not permissible.

7. Relational Operator - The second component in any clause of an initiation or completion cue is a relational operator. This one or two character entry is one of the following:

- = (equals)
- ¬= (not equals)
- > (greater than)
- < (less than)
- >= (greater than or equal to)
- <= (less than or equal to)

8. Values - The third component of any clause of an initiation or completion cue is a value associated with the control/display of the clause. The value must be one of the values associated with the particular control/display in the control/display catalogue.

The conventions utilized in the determination of values are outlined in detail in Appendix A.

When the value to be used is uncertain, TBD can be inserted to indicate that the value is 'to be determined'.

9. Previous Task Elements - Ordinarily the previous task element number will be associated with the initiation cue, since the initiation cue represents the outcome of the previous action. The form allows up to three previous task element numbers. The T (total) box to the left of the top previous task element should be filled in to indicate the number of previous task elements utilized. The format for each of the previous task elements is identical to that outlined in number 1 above.

10. Next Task Elements - Depending upon the outcome of the current action, different responses may be appropriate. Consequently, for each of the 3 completion cues, a set of three next task elements is available. Aligned with the top-most entry of each of the sets of next task elements is a T (total) box into which the number of next task elements per block of three is entered. The T box for the 2nd or 3rd set of next task elements will be completed only when more than one completion cue has been used.

The conventions for filling in these next task element numbers are the same as those outlined in number 1 above.

Action Sequence Information (items 11 through 14)

In Figure B.2, the top portion of the sheet is the action sequence. Included in the action sequence are the operator of the current action, an action verb, a control or display acted upon, the duration of the current action and crew interaction involved in the action.

11. Operator - The operator field indicates the crew member(s) involved in the current action. The entries are either blank or 1, with 1 indicating participation.

12. Interaction - The interaction field indicates situations in which either crew members and other individuals must interact in order to perform the current action. The field is a bit string, with 10 bits (columns 5-14). Currently columns 5-12 have been assigned meanings:

5	Pilot	9	Ground Observer
6	Copilot	10	Crew Chief
7	OSC	11	Guards
8	DSO	12	Ground Controller

13. Action Verb - The action verb is a one or two word characterization of the major action involved in the current task element. A set of permissible action verbs has been extracted from Oller's glossary of action verbs in human factors Task Data Base. The set of action verbs, with acceptable synonyms, is listed in Appendix C.

14. Time - This four character field indicates the duration in seconds of the current action. The number should be right-justified within the field. In addition to numbers, two other entries are permissible:

IND - Indefinte
CONT - Continuous
VAR - Variable

15. Classified Remarks - The T (total) box to the left of the classification for the first remark should be filled in to indicate the number of remarks. For each remark, the remark must be classified by placing a 1 in one or more of the classification boxes for the remark. This classification will be used when retrieving remarks on a particular subject. Currently, the categories of classifications include all of the categories of information on the Task Element Worksheet.

Additional Conventions:

1) TBD (to be determined) is permissible only where a value associated with a control or display cannot currently be determined.

2) If there is no initiation or completion cue, the T box associated with the initiation cue or the T box associated with the first completion cue should be filled in with zero, and the rest of the cue left blank.

Figures B.7 through B.10 are referred to in sections 2, 3, and 5.

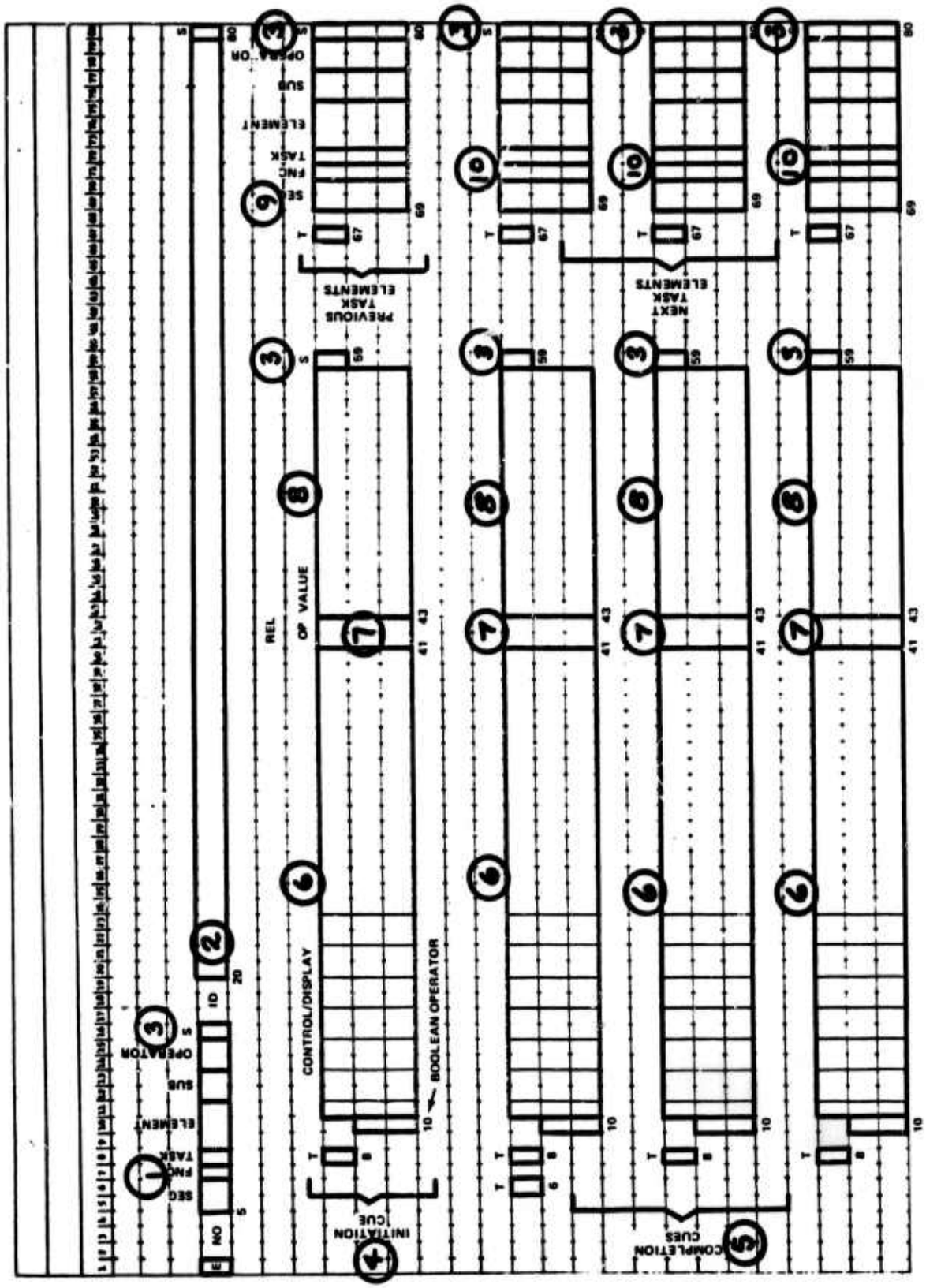

Figure B.1 TASK ELEMENT WORKSHEET (1 of 2)

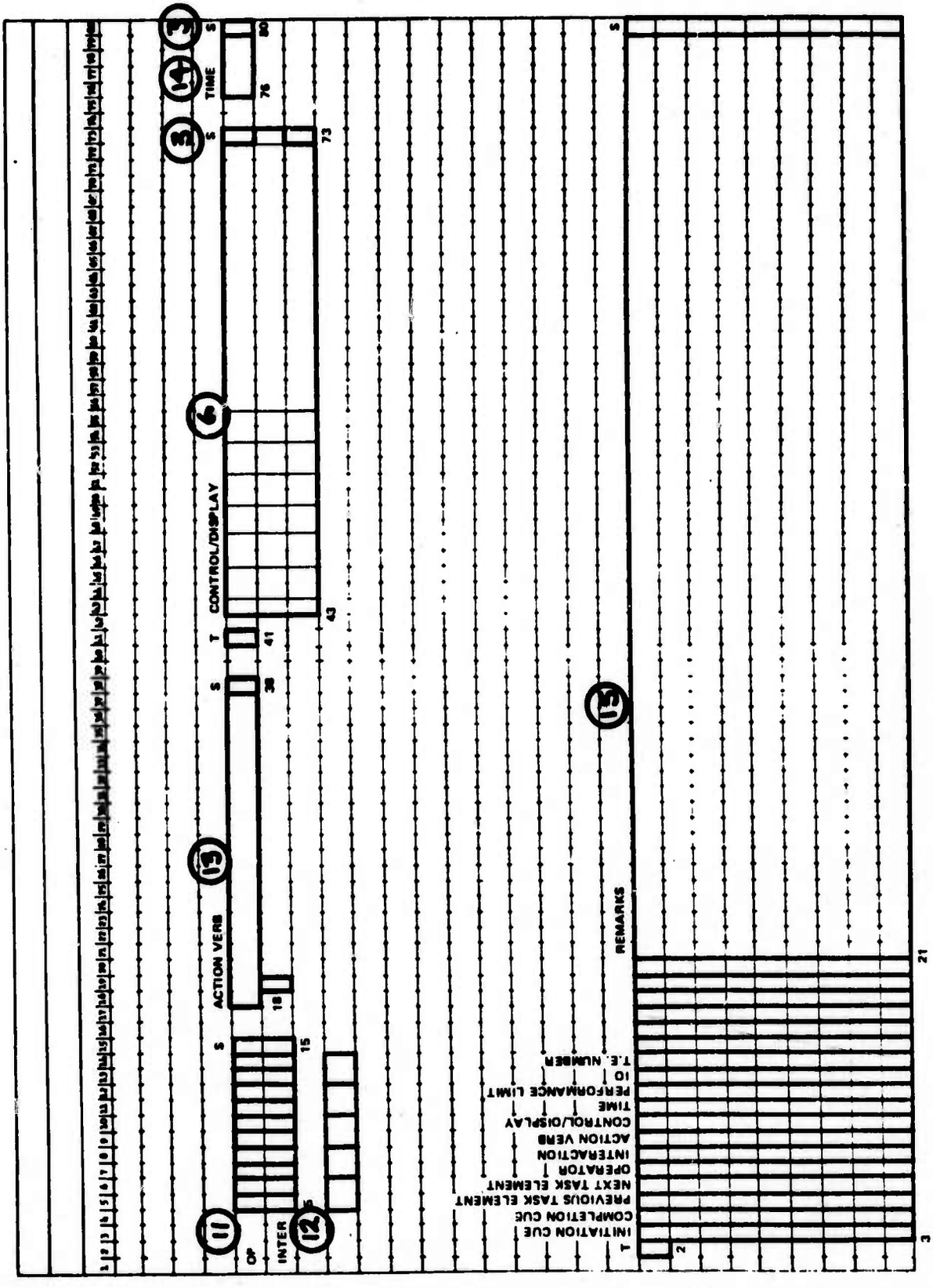

Figure B.2 TASK ELEMENT WORKSHEET (2 of 2)

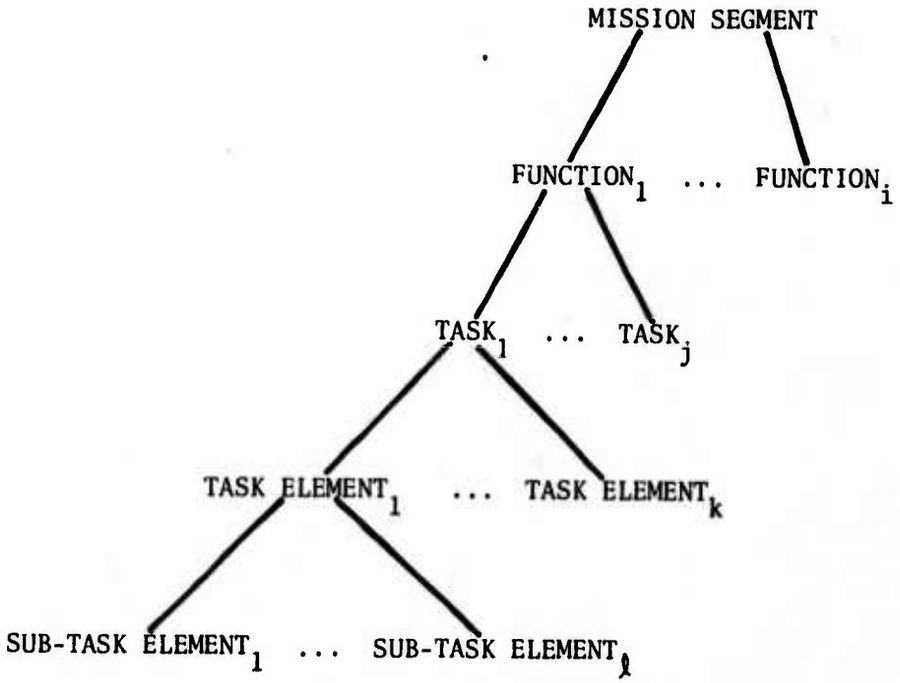

FIGURE B.3 B-1 Task Data Hierarchy

TASK DATA SHEET

10.0 Mission Segment Descent
10.1 Function Perform Pre-Descent Operations Code A X B ___ C ___ D ___
10.1.1 Task Execute Terrain-Following (TF) Operational Checks Frequency of Occurence 1

Crew Task Element No.	Task Description	Time (Sec.)	C/D Ident.	Initial Cue	Completion Cue	Remarks
10.1.1.1A	Set POWER SET/TEST control knob on Radar Altimeter to "1000"	4.0	F1-7.1.6 F1-7.1.7	Checklist item	VARIABLE ALTITUDE INDEX MARKER positioned to "1000" clearance plane setting	The following predescent checks are conducted w/i 30 minutes of descent

FIGURE B.4 Task Data Example

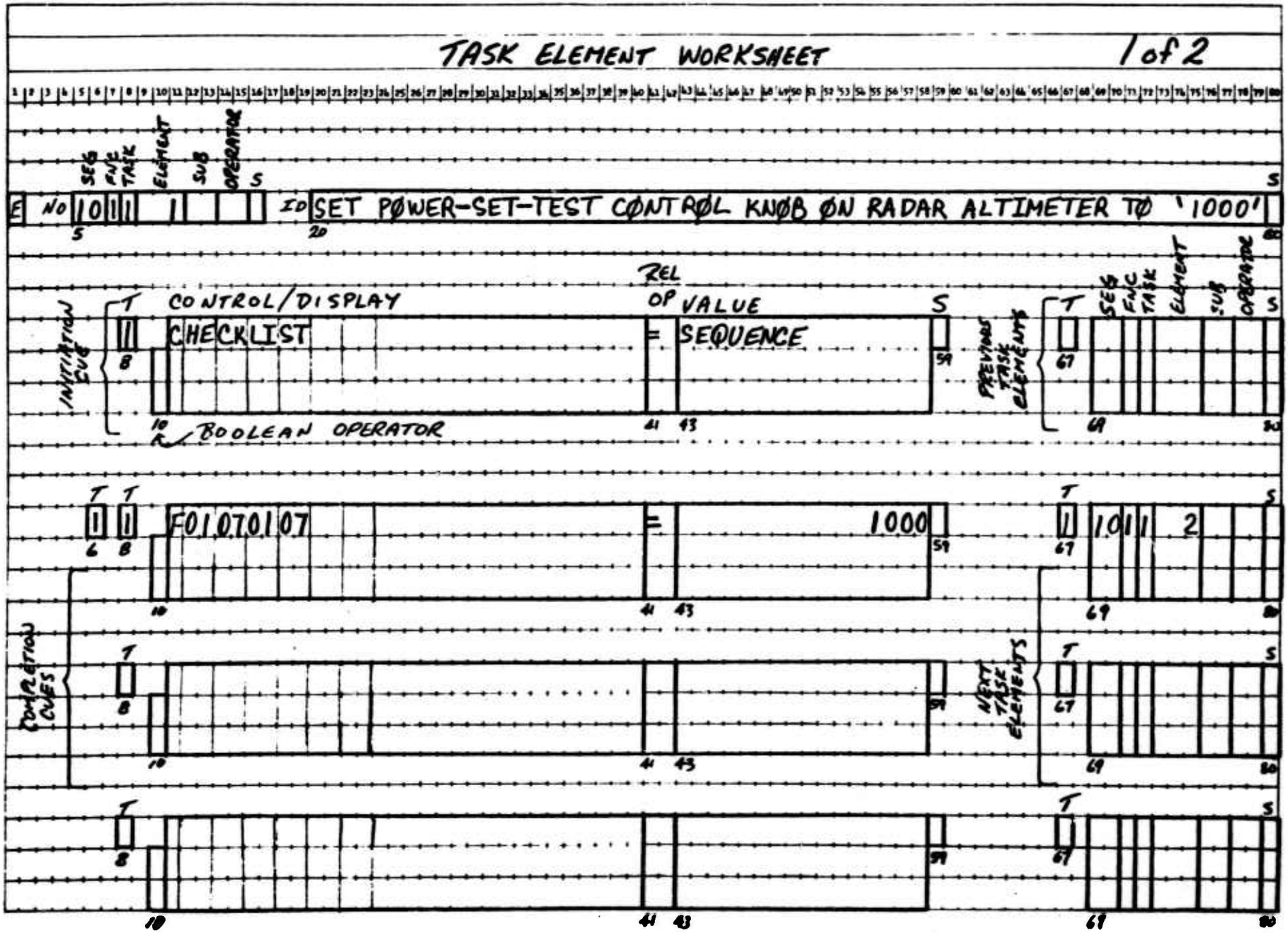

FIGURE B.5 Encoded Task Element Worksheet Example

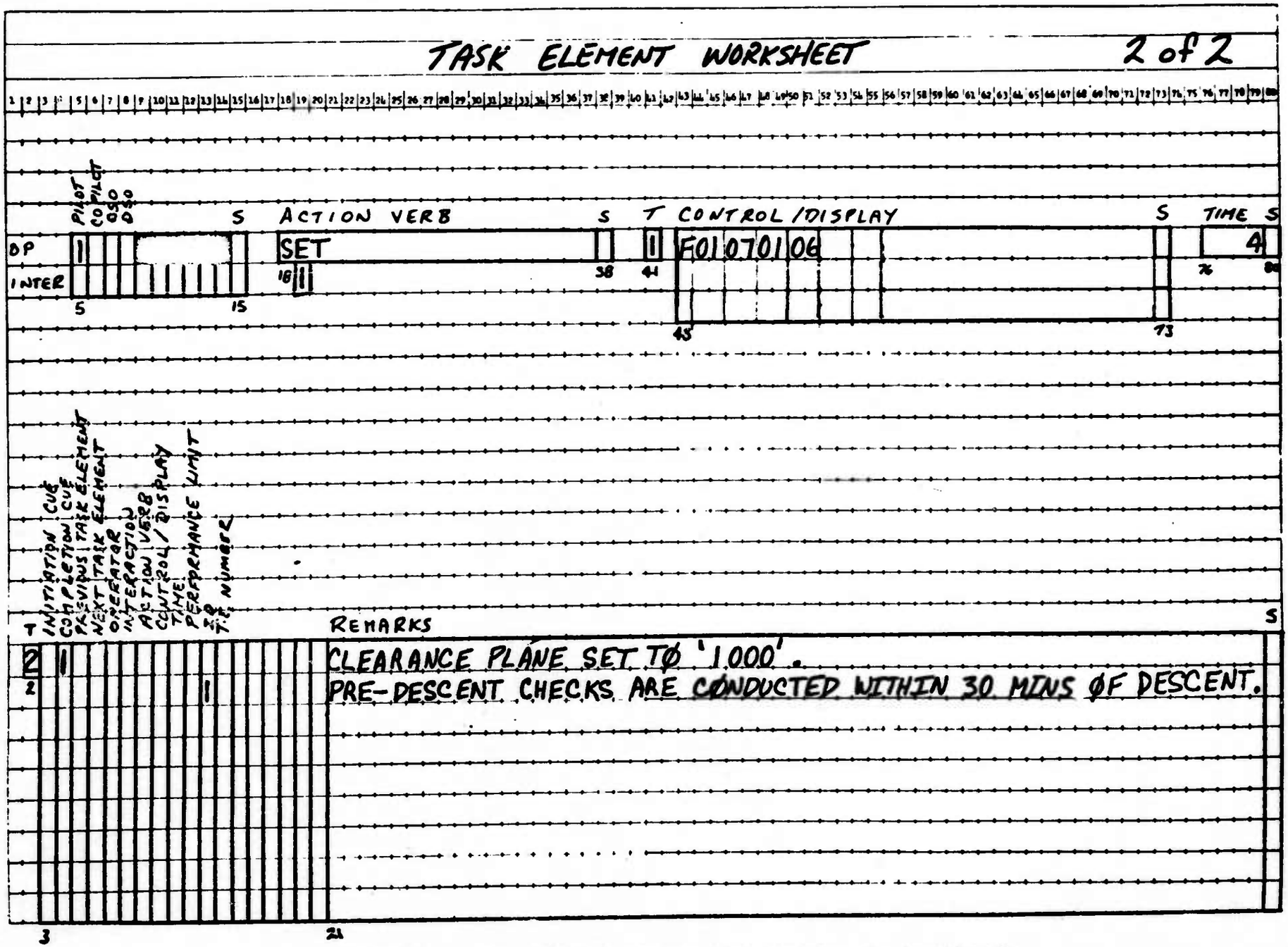

FIGURE B.6 Encoded Task Element Worksheet Example (continued)

FIGURE B.7

B A S I C V A R I A B L E S - TASK ELEMENT RECORDS	
VARIABLE	D E S C R I P T I O N
AV	ACTION VERB
C.E.R1	CLASSIFICATION OF TASK ELEMENT REMARK 1
C.E.R2	CLASSIFICATION OF TASK ELEMENT REMARK 2
C.E.R3	CLASSIFICATION OF TASK ELEMENT REMARK 3
C.E.R4	CLASSIFICATION OF TASK ELEMENT REMARK 4
C.E.R5	CLASSIFICATION OF TASK ELEMENT REMARK 5
C.E.R6	CLASSIFICATION OF TASK ELEMENT REMARK 6
C.E.R7	CLASSIFICATION OF TASK ELEMENT REMARK 7
C.E.R8	CLASSIFICATION OF TASK ELEMENT REMARK 8
C.E.R9	CLASSIFICATION OF TASK ELEMENT REMARK 9
CD1	CONTROL/DISPLAY 1
CD2	CONTROL/DISPLAY 2
CD3	CONTROL/DISPLAY 3
CQ1	COMPLETION CUE 1
CQ2	COMPLETION CUE 2
CQ3	COMPLETION CUE 3
E.ID	TASK ELEMENT IDENTIFICATION
E.R1	TASK ELEMENT REMARK 1
E.R2	TASK ELEMENT REMARK 2
E.R3	TASK ELEMENT REMARK 3
E.R4	TASK ELEMENT REMARK 4
E.R5	TASK ELEMENT REMARK 5
E.R6	TASK ELEMENT REMARK 6
E.R7	TASK ELEMENT REMARK 7
E.R8	TASK ELEMENT REMARK 8
E.R9	TASK ELEMENT REMARK 9
E#	TASK ELEMENT NUMBER
INTER	INTERACTION PERSONNEL
IQ	INITIATION CUE
NE1.CQ1	NEXT TASK ELEMENT 1 FOR COMPLETION CUE 1
NE1.CQ2	NEXT TASK ELEMENT 1 FOR COMPLETION CUE 2
NE1.CQ3	NEXT TASK ELEMENT 1 FOR COMPLETION CUE 3
NE2.CQ1	NEXT TASK ELEMENT 2 FOR COMPLETION CUE 1
NE2.CQ2	NEXT TASK ELEMENT 2 FOR COMPLETION CUE 2
NE2.CQ3	NEXT TASK ELEMENT 2 FOR COMPLETION CUE 3
NE3.CQ1	NEXT TASK ELEMENT 3 FOR COMPLETION CUE 1
NE3.CQ2	NEXT TASK ELEMENT 3 FOR COMPLETION CUE 2
NE3.CQ3	NEXT TASK ELEMENT 3 FOR COMPLETION CUE 3
OP	OPERATOR PERSONNEL
PE1	PREVIOUS TASK ELEMENT 1
PE2	PREVIOUS TASK ELEMENT 2
PE3	PREVIOUS TASK ELEMENT 3

FIGURE B.7 (CONTINUED)

B A S I C V A R I A B L E S - TASK ELEMENT RECORDS

VARIABLE	DESCRIPTION
S.AV	SOURCE OF DATA FOR THE APPROPRIATE VARIABLE
S.CD1	.
S.CD2	.
S.CD3	.
S.CQ1	.
S.CQ2	.
S.CQ3	.
S.E.ID	.
S.E.R1	.
S.E.R2	.
S.E.R3	.
S.E.R4	.
S.E.R5	.
S.E.R6	.
S.E.R7	.
S.E.R8	.
S.E.R9	.
S.E#	.
S.INTER	.
S.IQ	.
S.NE1.CQ1	.
S.NE1.CQ2	.
S.NE1.CQ3	.
S.NE2.CQ1	.
S.NE2.CQ2	.
S.NE2.CQ3	.
S.NE3.CQ1	.
S.NE3.CQ2	.
S.NE3.CQ3	.
S.OP	.
S.PE1	.
S.PE2	.
S.PE3	.
S.TIME	.
TIME	DURATION OF TASK

FIGURE B.7 (CONTINUED)

B A S I C V A R I A B L E S - TASK ELEMENT RECORDS

VARIABLE	DESCRIPTION
S.AV	SOURCE OF DATA FOR THE APPROPRIATE VARIABLE
S.CD1	.
S.CD2	.
S.CD3	.
S.CQ2	.
S.CQ3	.
S.E.ID	.
S.E.R1	.
S.E.R2	.
S.E.R3	.
S.E.R4	.
S.E.R5	.
S.E.R6	.
S.E.R7	.
S.E.R8	.
S.E.R9	.
S.E#	.
S.INTER	.
S.IQ	.
S.NE1.CQ1	.
S.NE1.CQ2	.
S.NE1.CQ3	.
S.NE2.CQ1	.
S.NE2.CQ2	.
S.NE2.CQ3	.
S.NE3.CQ1	.
S.NE3.CQ2	.
S.NE3.CQ3	.
S.OP	.
S.PE1	.
S.PE2	.
S.PE3	.
S.TIME	.
TIME	DURATION OF TASK

FIGURE B.8

S Y N O N Y M S - TASK ELEMENT RECORDS

VARIABLE	D E S C R I P T I O N
ACTION-VERB	SYNONYM FOR AV - ACTION VERB
INIT-CUE	SYNONYM FOR IQ - INITIATION CUE

FIGURE B.9

GROUPS - TASK ELEMENT RECORDS

VARIABLE	DESCRIPTION
C&DS	CONTROLS/DISPLAYS ACTED ON
C&DS-ALL	CONTROLS/DISPLAYS ACTED ON PLUS THOSE USED IN COMPLETION AND INITIATION CUES
C&DS-CMP-CUE	CONTROLS/DISPLAYS USED IN COMPLETION CUES
C&DS-INT-CUE	CONTROLS/DISPLAYS USED IN INITIATION CUES
COM-CUES	COMPLETION CUES
INTERACTION	ALL PERSONNEL IN INTERACTION
NEXT-TE#	NEXT TASK ELEMENTS
OPERATOR	ALL PERSONNEL IN OPERATION
PRE-TE#	PREVIOUS TASK ELEMENTS
VAL	VALUES USED IN COMPLETION AND INITIATION CUES

FIGURE 6.10

CLASSIFIED COMMENTS - TASK ELEMENT RECORDS	
VARIABLE	DESCRIPTION
*ACTION-VERB	ACTION VERB COMMENTS
*C&D	CONTROL/DISPLAY COMMENTS
*COMP-CUE	COMPLETION CUE COMMENTS
*ID	TASK ELEMENT IDENTIFICATION COMMENTS
*INIT-CUE	INITIATION CUE COMMENTS
*INTERACTION	INTERACTION COMMENTS
*NEXT-TE#	NEXT TASK ELEMENT COMMENTS
*OPERATOR	OPERATOR COMMENTS
*PERFORM-LMT	PERFORMANCE LIMIT COMMENTS
*PRE-TE#	PREVIOUS TASK ELEMENT COMMENTS
*TE#	TASK ELEMENT NUMBER COMMENTS
*TIME	TASK ELEMENT DURATION COMMENTS

APPENDIX C

This appendix describes the format of the thesauri file.

The thesauri file contains card images of the form:

Thesaurus name	(columns 1-20 left justified)
Item name	(columns 21-50 left justified)
Standard form	(columns 51-80 left justified)

The standard form is the name that is substituted for the item name. The file must be sorted by thesaurus name and item name. A blank card must precede each thesaurus.

At the present time, only the ACTION VERB thesaurus has been defined.

PART 2

PROGRAMMER'S GUIDE

TABLE OF CONTENTS

LIST OF FIGURES

INTRODUCTION

The programmer's guide is a supplement to the user's guide. Flow charts are given in Section 1. Record layouts are given in Section 2. Section 3 describes the drive tables. Section 4 describes the load modules and their usage.

1. FLOW CHARTS

High level flow charts are given for the

Control/Display File Maintenance Subsystem
(Figures 1.1.1 through 1.1.4)

Task Element File Maintenance Subsystem
(Figures 1.2.1 through 1.2.5)

Query Subsystem
(Figure 1.3)

Create Invert List Programs
(Figure 1.4)

Pack Invert List Program
(Figure 1.5)

Control/Display Task Element Cross Reference Program
(Figure 1.6)

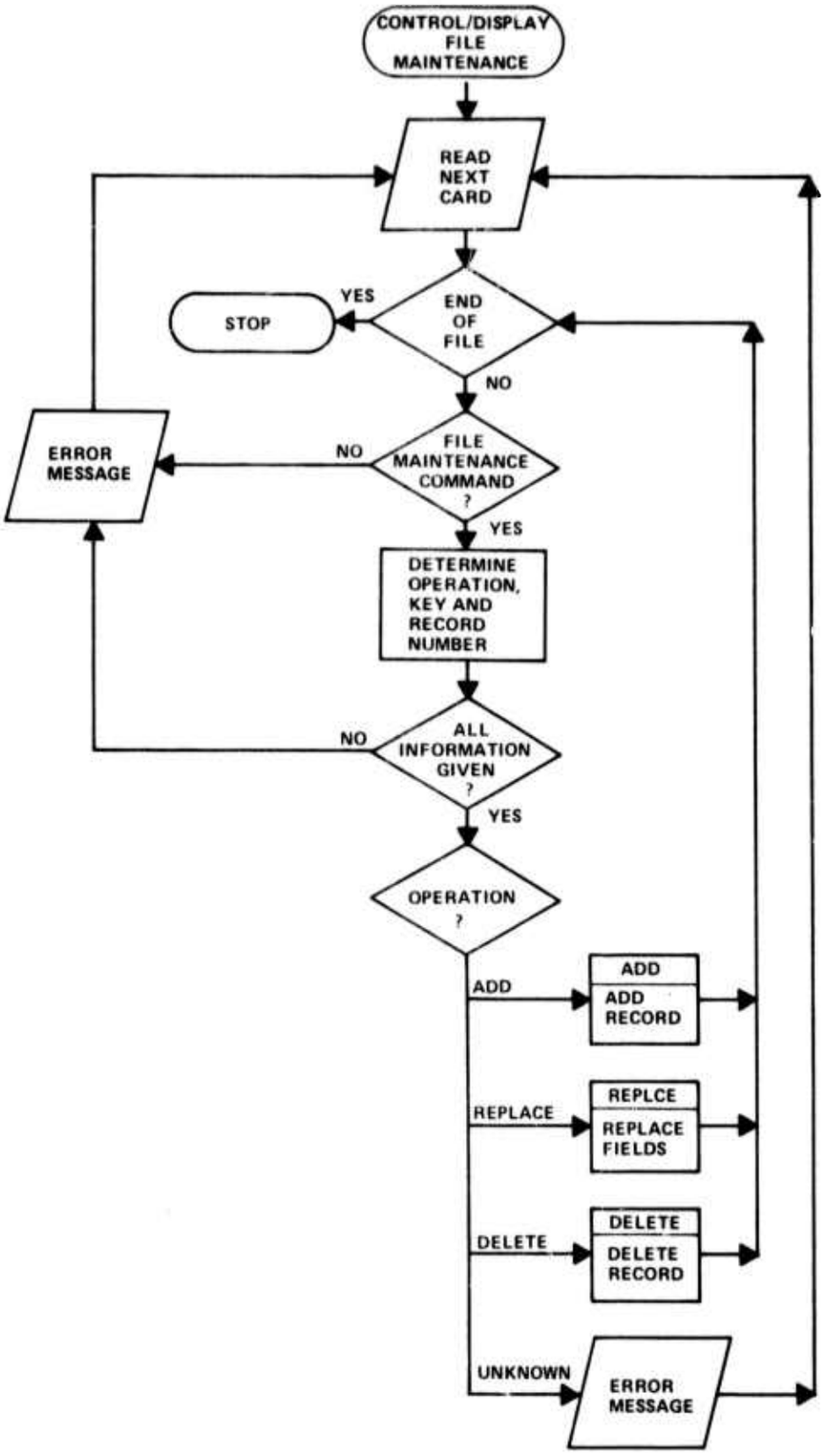

Figure 1.1.1 CONTROL/DISPLAY FILE MAINTENANCE SUBSYSTEM

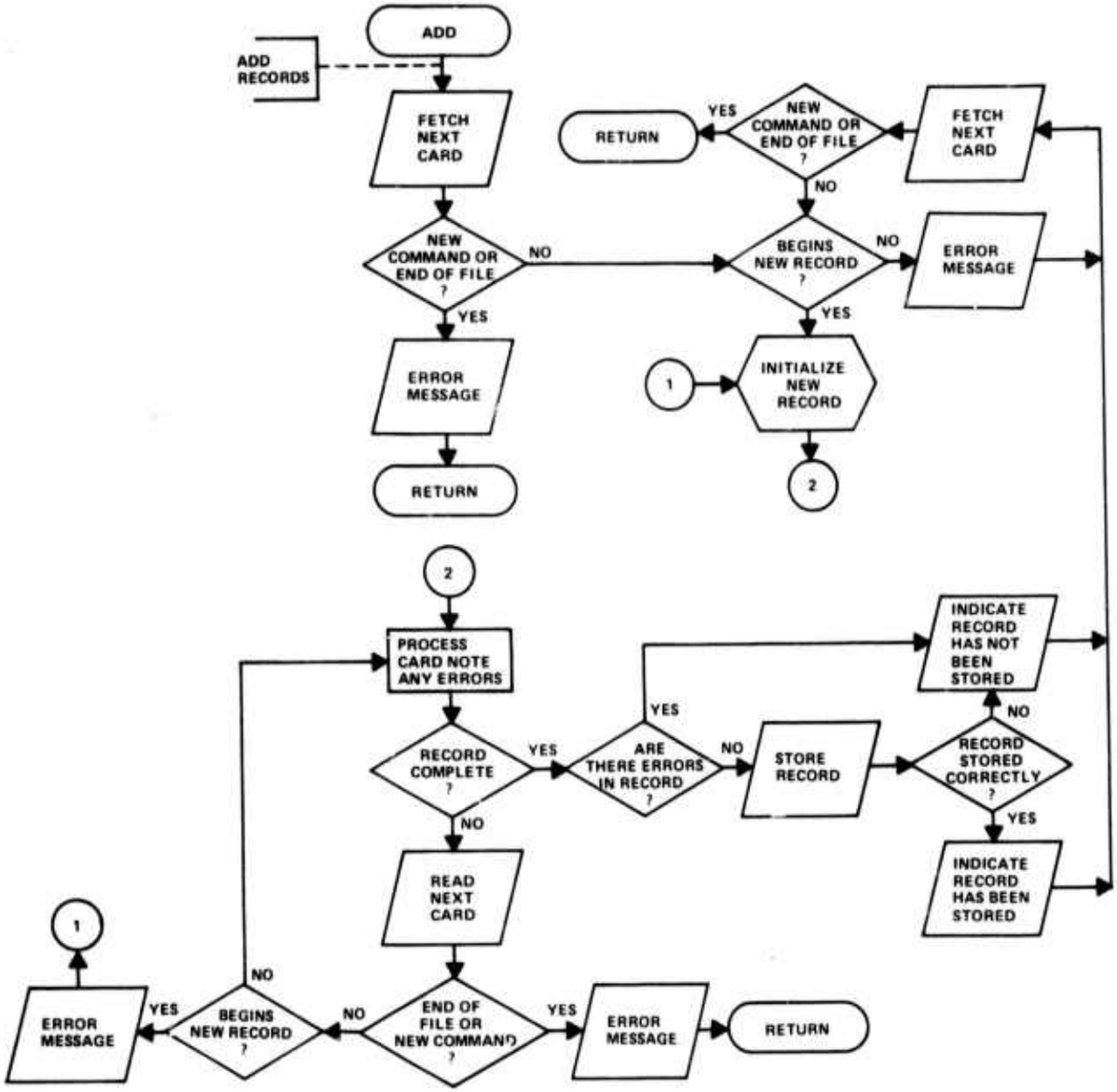

Figure 1.1.2 CONTROL/DISPLAY FILE MAINTENANCE SUBSYSTEM (CONT.)

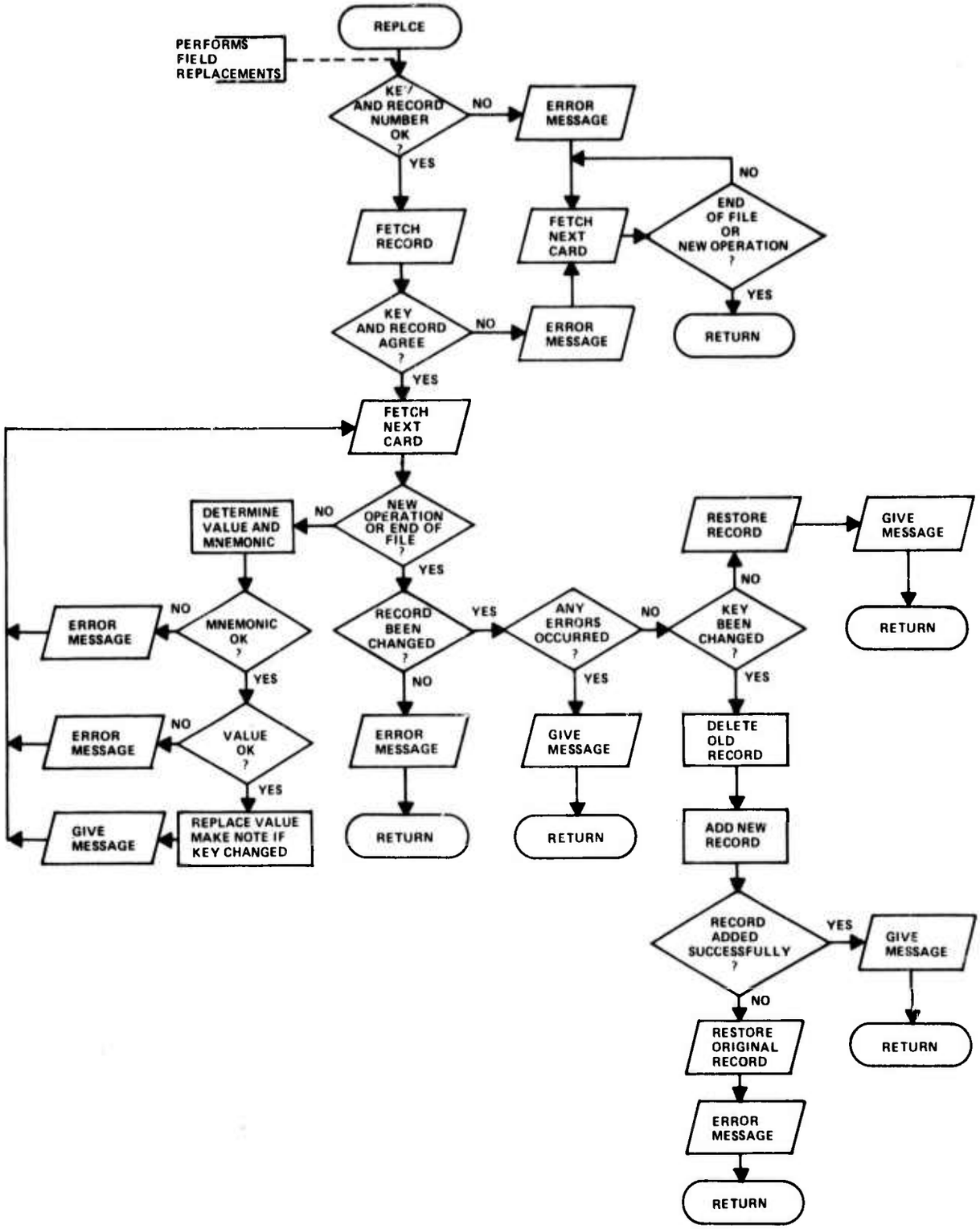

Figure 1.1.3 CONTROL/DISPLAY FILE MAINTENANCE SUBSYSTEM (CONT.)

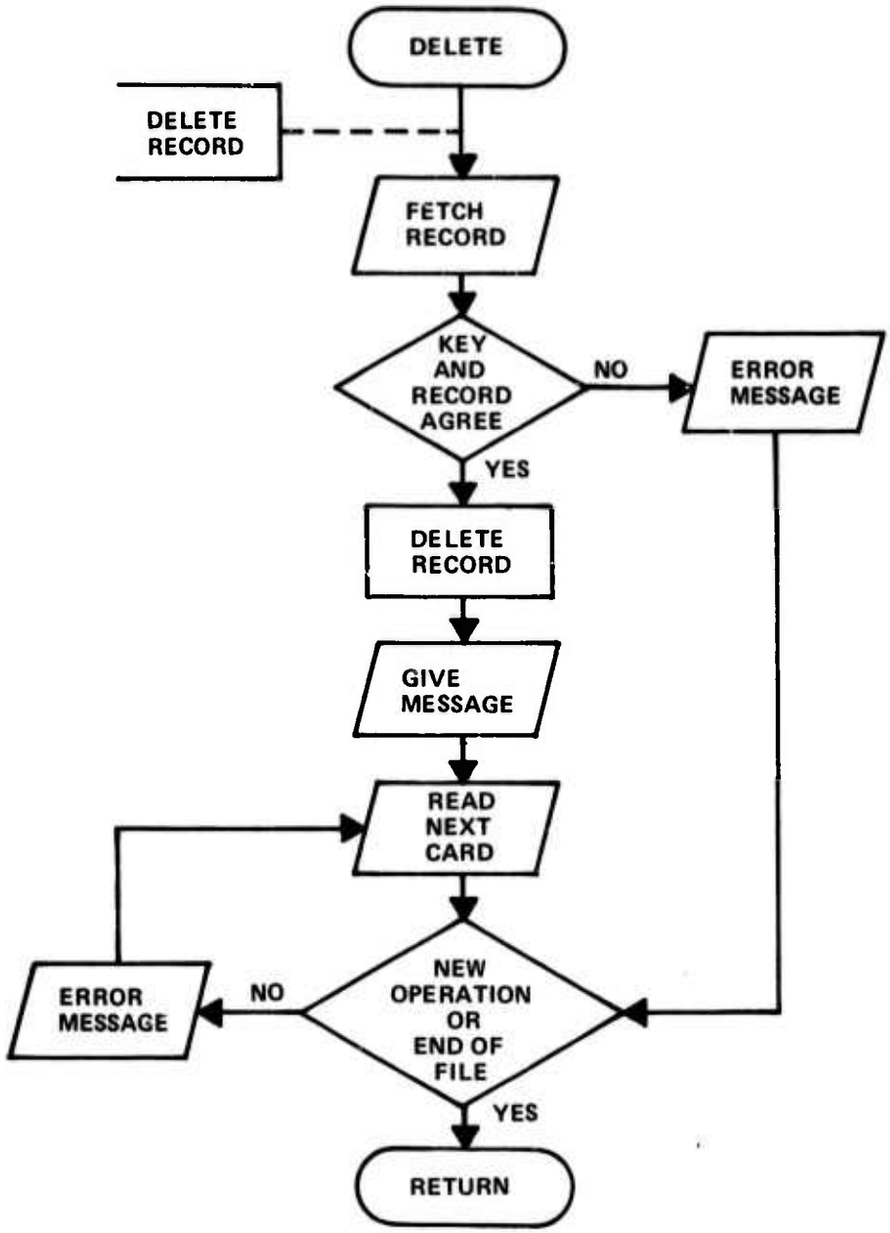

Figure 1.1.4 CONTROL/DISPLAY FILE MAINTENANCE SUBSYSTEM (continued)

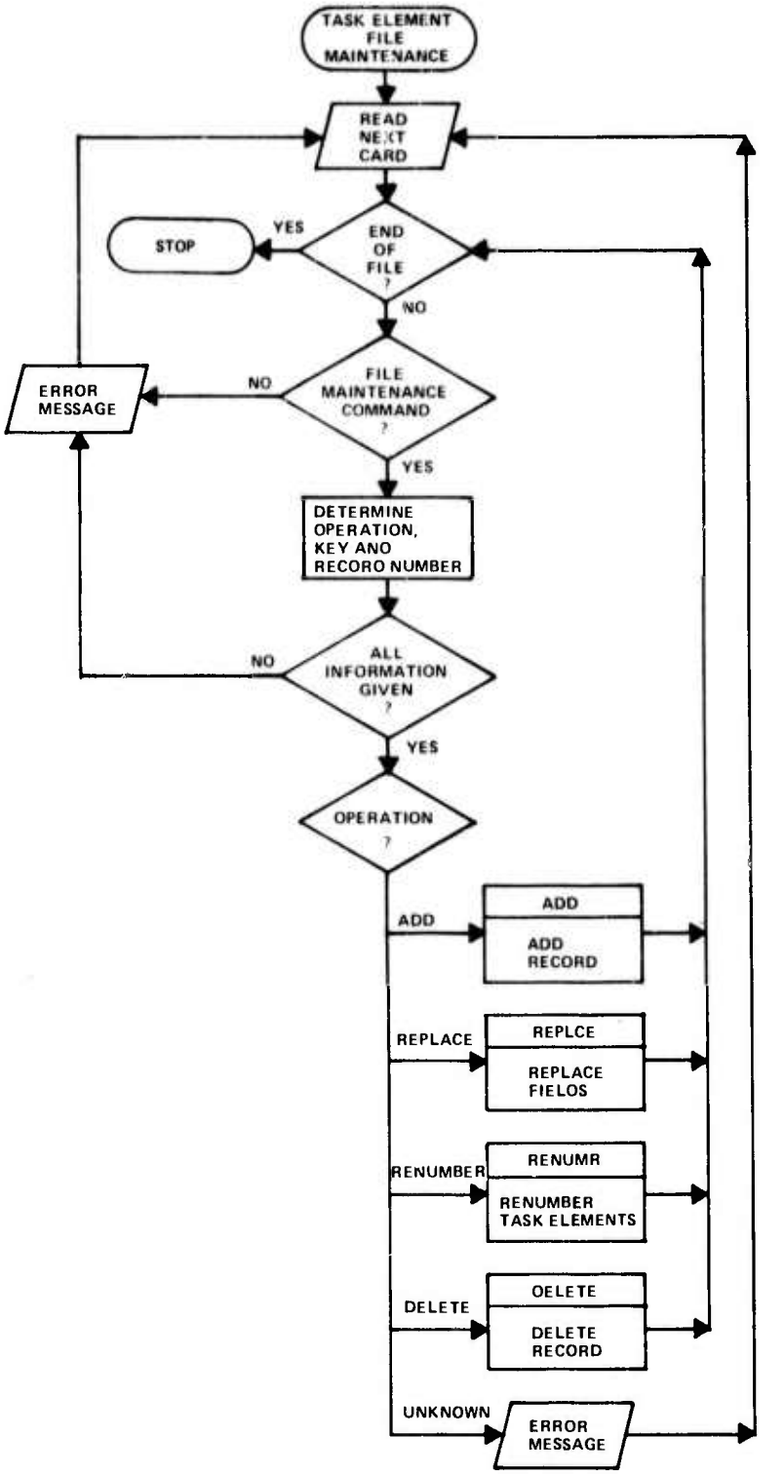

Figure 1.2.1 TASK ELEMENT FILE MAINTENANCE SUBSYSTEM

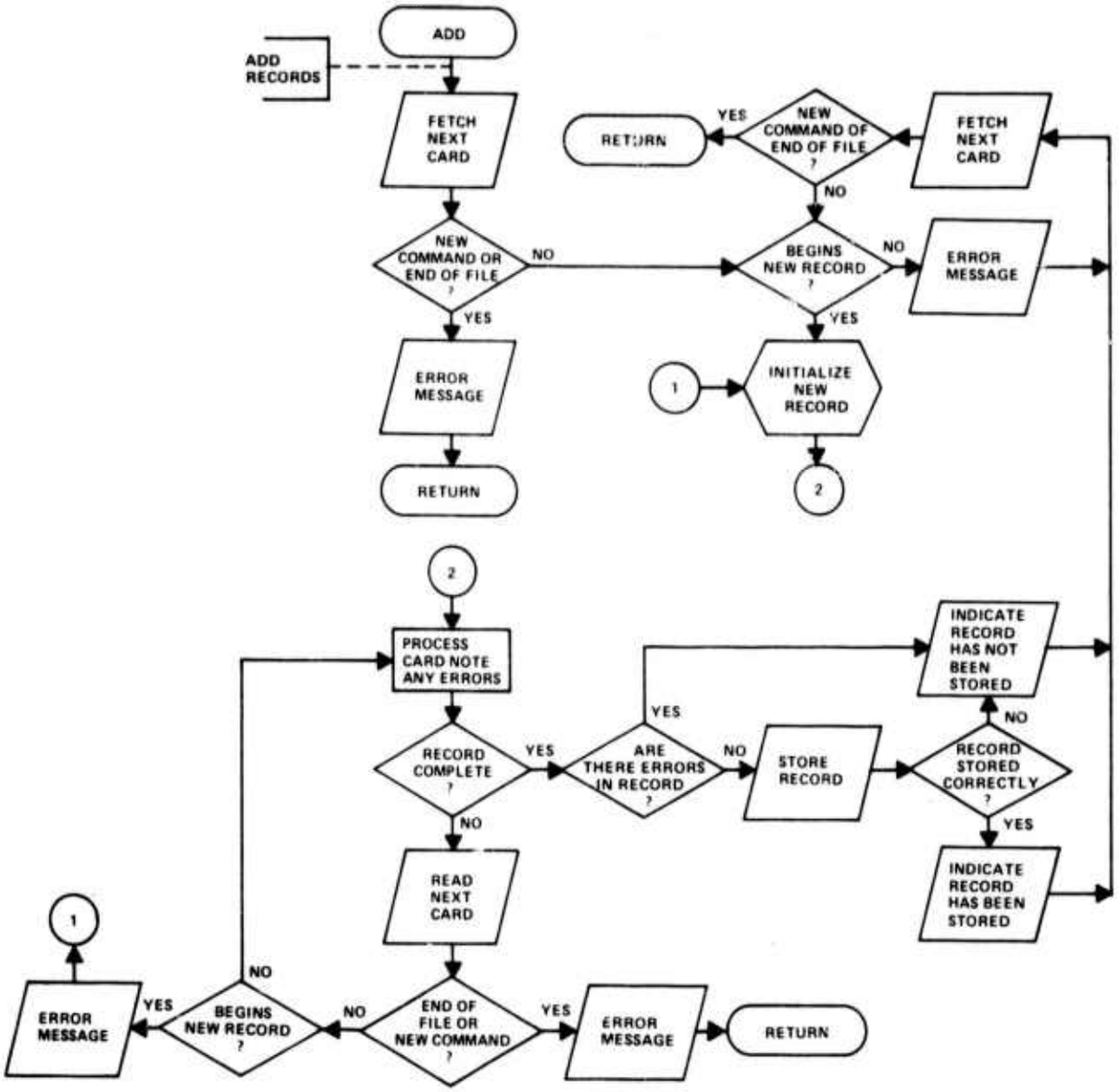

Figure 1.2.2 TASK ELEMENT FILE MAINTENANCE SUBSYSTEM (continued)

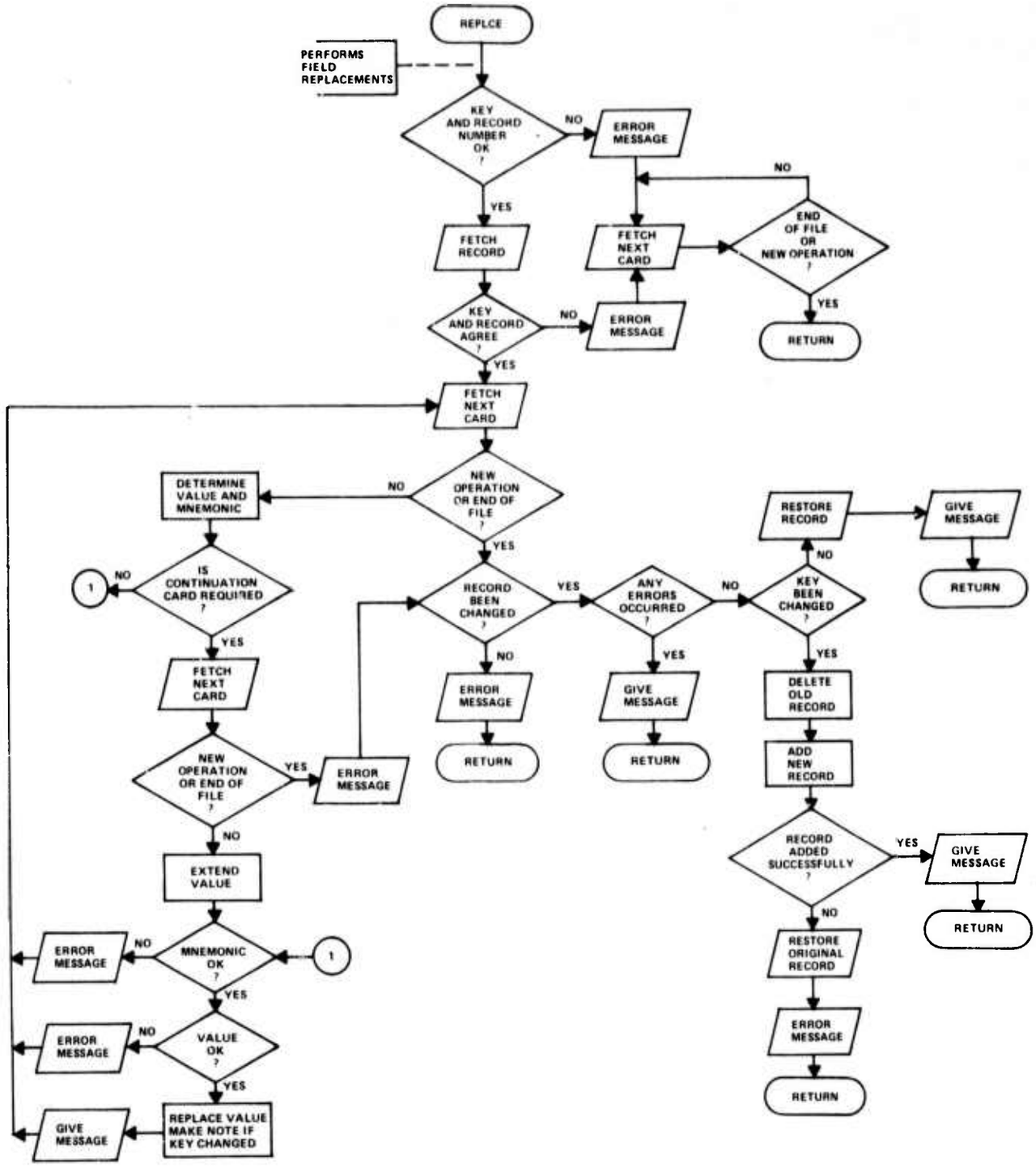

Figure 1.2.3 TASK ELEMENT FILE MAINTENANCE SUBSYSTEM (Continued)

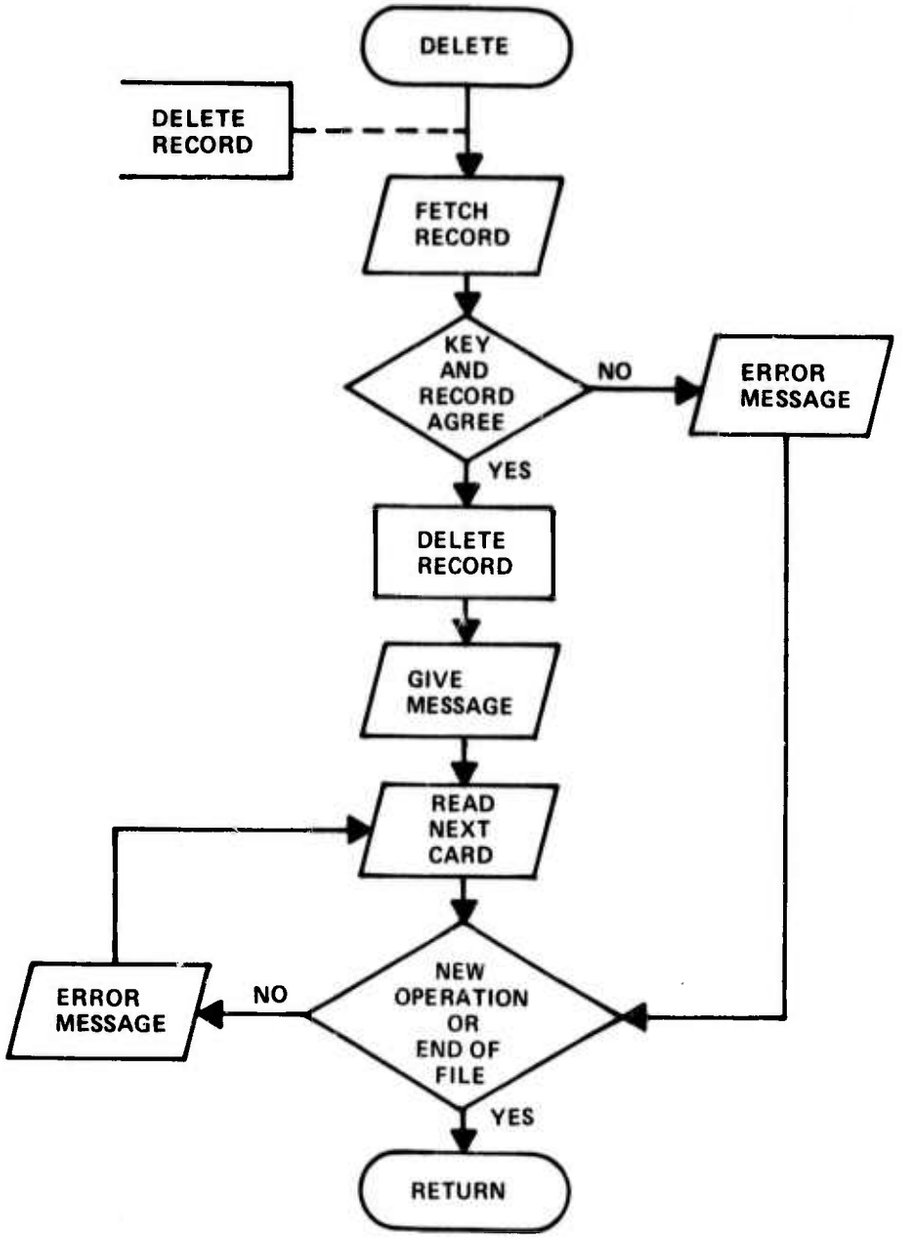

Figure 1.2.4 TASK ELEMENT FILE MAINTENANCE SUBSYSTEM (Cont.)

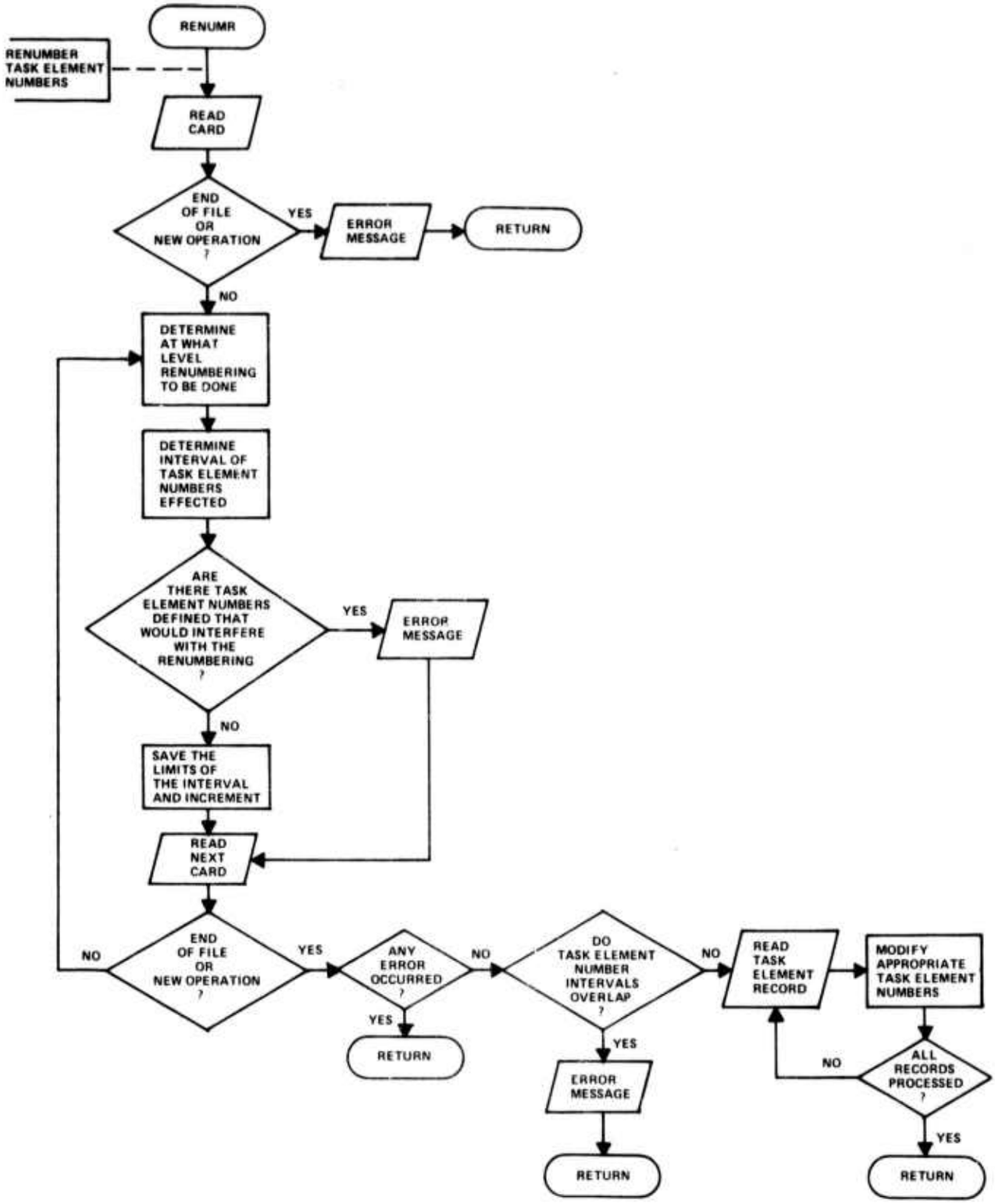

Figure 1.2.5 TASK ELEMENT FILE MAINTENANCE SUBSYSTEM (Cont.)

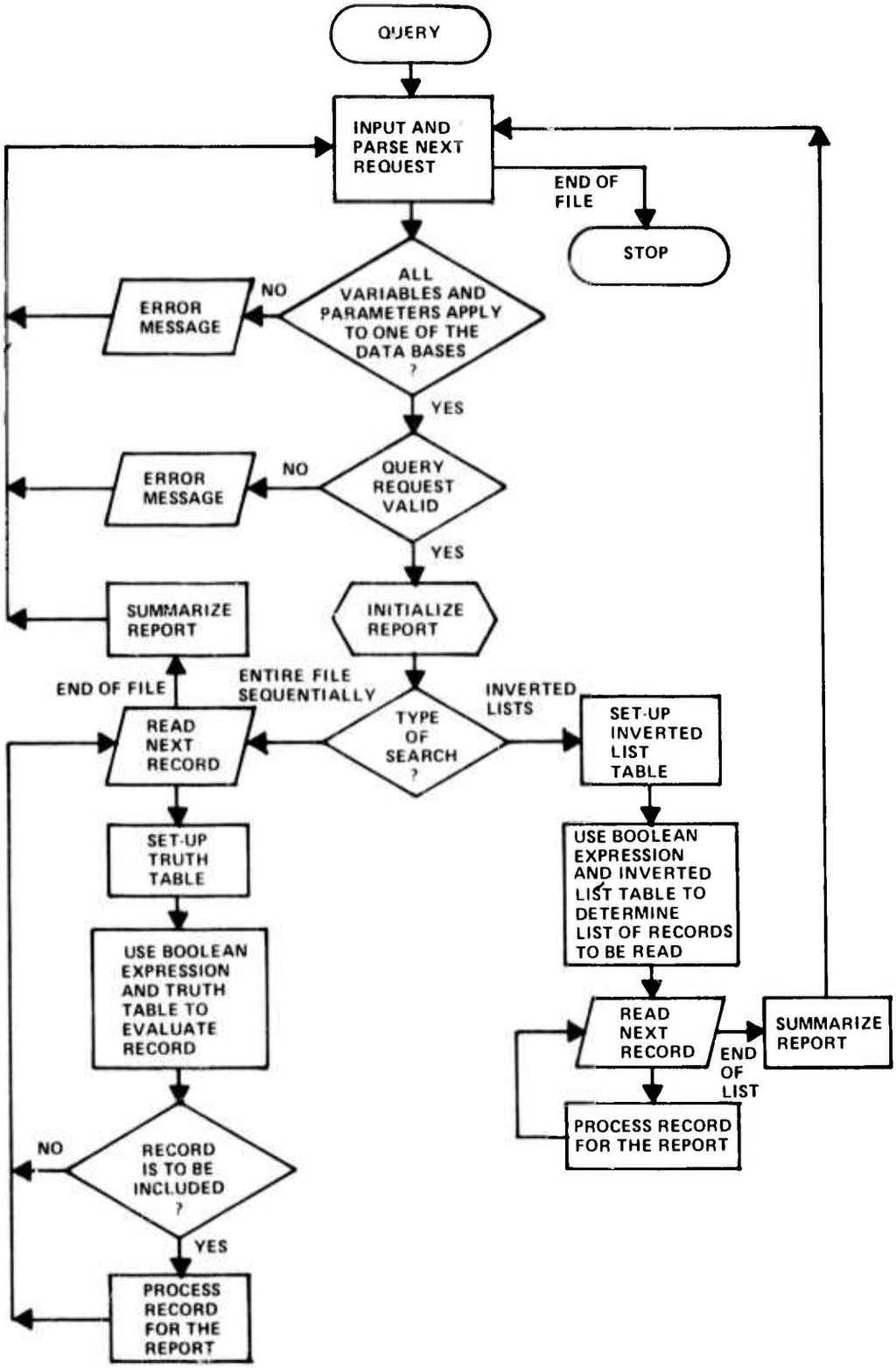

Figure 1.3 QUERY SUBSYSTEM

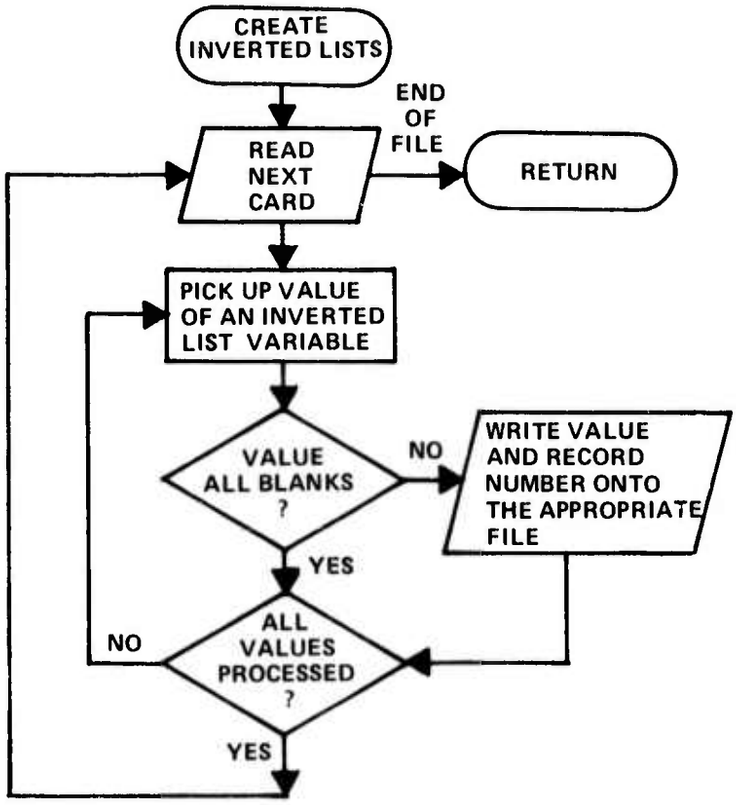

Figure 1.4 CREATE INVERT LIST PROGRAMS

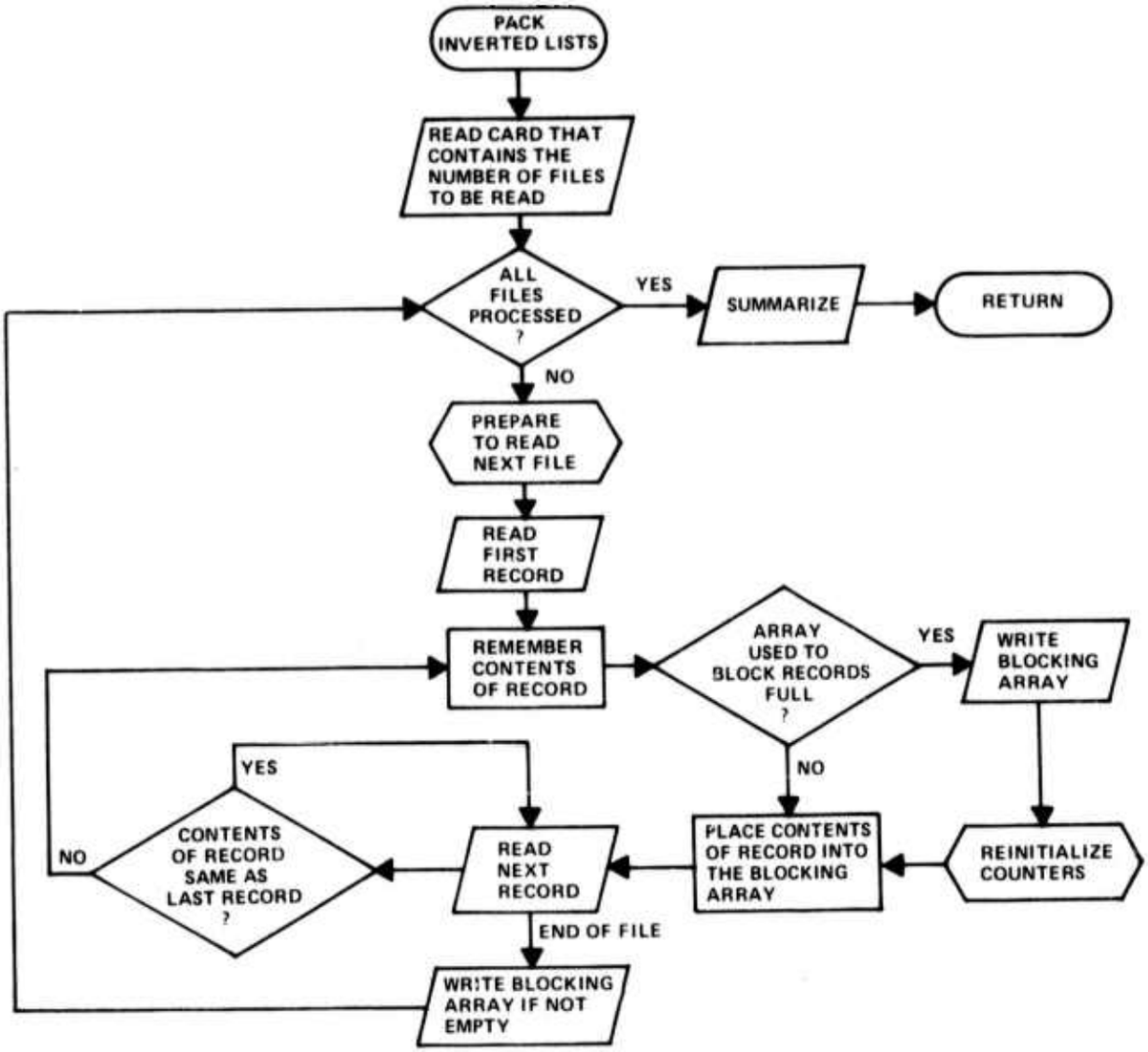

Figure 1.5 PACK INVERTED LIST PROGRAM

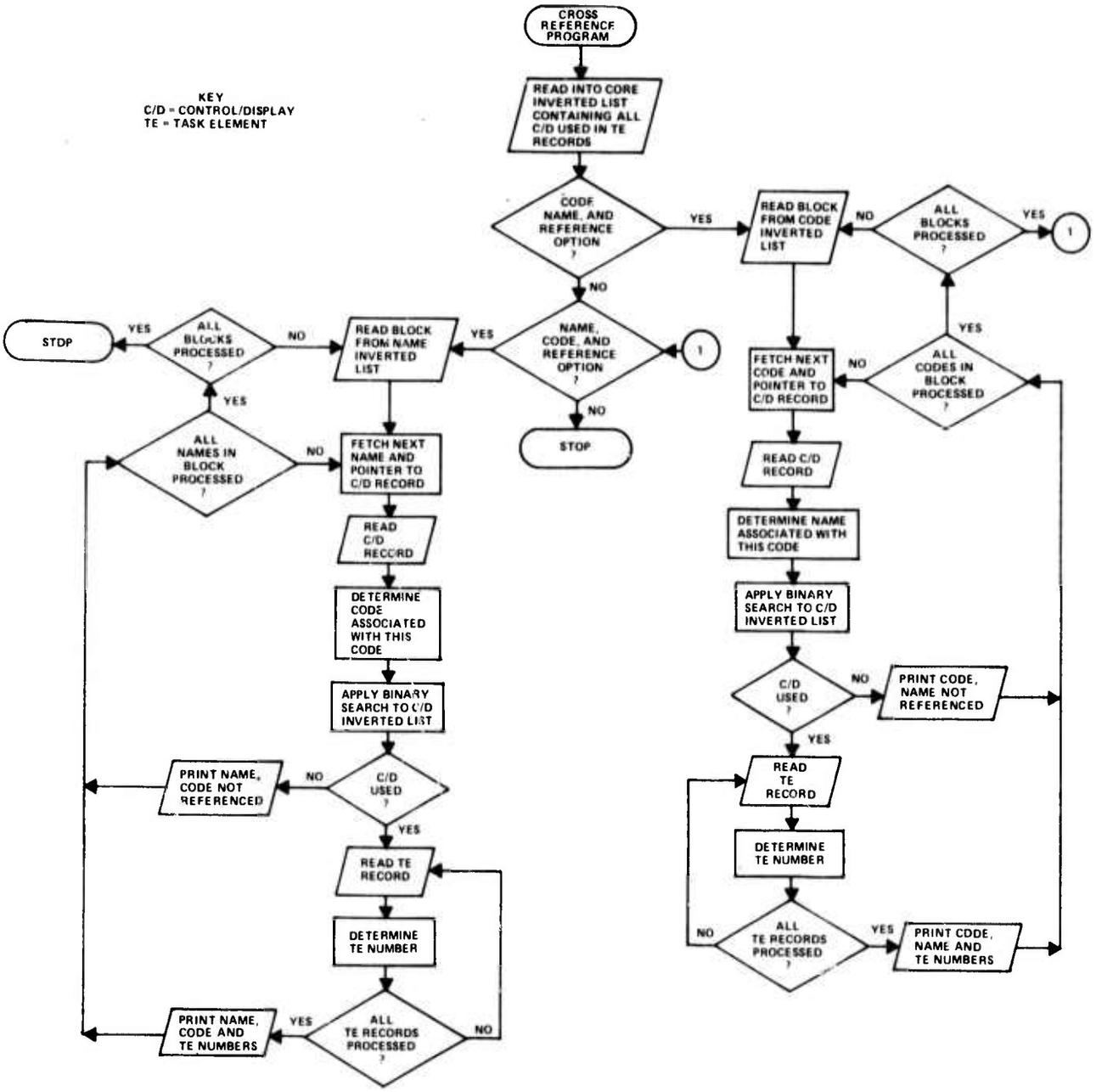

Figure 1.6 CONTROL/DISPLAY - TASK ELEMENT CROSS REFERENCE PROGRAM

2. RECORD LAYOUTS

The record layout for Control/Display records is given in Figure 2.1; the record layout for Task Element records is given in Figure 2.2.

The "byte address" is the location of the value of the variable in the record. Bytes are numbered from zero.

The number of bytes is the length of the value of the variable.

The inverted list number is the unit number of the inverted list file containing the values of the variable. In Figures 2.1 and 2.2, an inverted list number is given for a variable even if only part of its value is stored in the inverted list. An example of this situation is for the inverted list containing all controls/displays referenced by task elements. This list contains the control/displays specified in initiation and completion cues but disregards other cue information. Also, in these figures, an inverted list number is given to each variable that contributes values to an inverted list. For instance, the inverted list containing all control/displays acted on by task elements contains values of variables CD1, CD2, and CD3.

The classification byte number is the byte in the classification that, when not blank, indicates the comment associated with the classification applied to the value of this variable. The classification byte number starts at 1.

The program number is a number used to index a subroutine that checks the value for validity. Only task element variables are tested for validity.

3. DRIVE TABLES

The items in records are located by table look-ups using the mnemonic name of the item. These tables contain information such as mnemonic names, length of value, location of value in record, and the inverted list number. These drive tables are initialized by BLOCK COMMON.

3.1 Control/Display Drive Tables

The Control/Display drive tables are located in common blocks CDMAP1, CDMAP2, CDMAP3, and CDMAP4.

3.1.1 Drive Table MAP1

MAP1(1,J) = number of bytes in value.

MAP1(2,J) = byte location within the record.

MAP1(3,J) = card number where item is found when adding the record.

FIGURE 2.1

RECORD LAYOUT - CONTROL/DISPLAY FILE

BASIC VARIABLE	BYTE ADDRESS	# OF BYTES	INVERTED LIST #	CLASSIFICATION BYTE #
C-CLASS1	270	9	NA	NA
C-CLASS2	349	.	.	.
C-CLASS3	428	.	.	.
C-CLASS4	507	.	.	.
C-CLASS5	586	.	.	.
C-CLASS6	665	.	.	.
C-CLASS7	744	.	.	.
C-CLASS8	823	.	.	.
C-CLASS9	902	.	.	.
CODE#	0	13	11	1
COMMENT1	279	70	NA	NA
COMMENT2	358	.	.	.
COMMENT3	437	.	.	.
COMMENT4	516	.	.	.
COMMENT5	595	.	.	.
COMMENT6	674	.	.	.
COMMENT7	753	.	.	.
COMMENT8	832	.	.	.
COMMENT9	911	.	.	.
INTRVL-FLAG	93	1	.	.
NAME	13	30	12	3
PANEL	43	4	13	NA
SECTION	47	.	NA	.
SYNONYM1	145	20	15	7
SYNONYM2	165	.	.	.
SYNONYM3	185	.	.	.
TYPE	73	.	16	5
UNIT	51	.	14	4
VAL-IRR-FLAG	94	1	NA	NA
VALUE1	95	16	.	6
VALUE2	111	.	.	.
VALUE3	127	.	.	.
VALUE4	205	.	.	.
VALUE5	221	.	.	.
VALUE6	237	.	.	.
VALUE7	253	.	.	.
CORR-ACTION	NA	NA	.	9
FUNCTION	.	.	.	8
LOCATION	.	.	.	3

FIGURE 2.2

R E C O R D L A Y O U T - TASK ELEMENT FILE

BASIC VARIABLE	BYTE ADDRESS	# OF BYTES	INVERTED LIST #	CLASSIFICATION BYTE #	PROG. #
AV	0	20	21	7	6
C.E.R1	20	18	NA	NA	10
C.E.R2	38	.	.	.	.
C.E.R3	56	.	.	.	.
C.E.R4	74	.	.	.	.
C.E.R5	92	.	.	.	.
C.E.R6	110	.	.	.	.
C.E.R7	128	.	.	.	.
C.E.R8	146	.	.	.	.
C.E.R9	164	.	.	.	.
CD1	182	30	27,28	8	7
CD2	212	.	.	.	.
CD3	242	.	.	.	.
CQ1	272	146	28	2	4
CQ2	418	.	.	.	.
CQ3	564	.	.	.	.
E.ID	710	60	NA	1	.
E.R1	770	59	.	NA	3
E.R2	829	.	.	.	.
E.R3	888	.	.	.	.
E.R4	947	.	.	.	.
E.R5	1006	.	.	.	.
E.R6	1065	.	.	.	.
E.R7	1124	.	.	.	.
E.R8	1183	.	.	.	.
E.R9	1242	.	.	.	.
E#	1301	13	24	12	1
INTER	1314	10	22	6	9
IQ	1324	146	28	1	4
NE1.CQ1	1470	13	26	4	1
NE1.CQ2	1483	.	.	.	.
NE1.CQ3	1496	.	.	.	.
NE2.CQ1	1509	.	.	.	.
NE2.CQ2	1522	.	.	.	.
NE2.CQ3	1535	.	.	.	.
NE3.CQ1	1548	.	.	.	.
NE3.CQ2	1561	.	.	.	.
NE3.CQ3	1574	.	.	.	.
OP	1587	4	23	5	5
PE1	1591	13	25	3	1
PE2	1604	.	.	.	.
PE3	1617	.	.	.	.

FIGURE 2.2 (CONTINUED)

RECORD LAYOUT - TASK ELEMENT FILE

BASIC VARIABLE	BYTE ADDRESS	# OF BYTES	INVERTED LIST #	CLASSIFICATION BYTE #	PROG. #
S.AV	1630	1	NA	NA	2
S.CD1	1631	.	.	.	.
S.CD2	1632	.	.	.	.
S.CD3	1633	.	.	.	.
S.CQ1	1634	.	.	.	.
S.CQ2	1635	.	.	.	.
S.E.ID	1637	.	.	.	.
S.CQ3	1636	.	.	.	.
S.E.R1	1638	.	.	.	.
S.E.R2	1639	.	.	.	.
S.E.R3	1640	.	.	.	.
S.E.R4	1641	.	.	.	.
S.E.R5	1642	.	.	.	.
S.E.R6	1643	.	.	.	.
S.E.R7	1644	.	.	.	.
S.E.R8	1645	.	.	.	.
S.E.R9	1646	.	.	.	.
S.E#	1647	.	.	.	.
S.INTER	1648	.	.	.	.
S.IQ	1649	.	.	.	.
S.NE1.CQ1	1650	.	.	.	.
S.NE1.CQ2	1651	.	.	.	.
S.NE1.CQ3	1652	.	.	.	.
S.NE2.CQ1	1653	.	.	.	.
S.NE2.CQ2	1654	.	.	.	.
S.NE2.CQ3	1655	.	.	.	.
S.NE3.CQ1	1656	.	.	.	.
S.NE3.CQ2	1657	.	.	.	.
S.NE3.CQ3	1658	.	.	.	.
S.OP	1659	.	.	.	.
S.PE1	1660	.	.	.	.
S.PE2	1661	.	.	.	.
S.PE3	1662	.	.	.	.
S.TIME	1663	.	.	.	.
TIME	1664	4	.	9	8
PERFORM-LMT	NA	NA	NA	10	NA

MAP1(4,J) = column number where item is found when adding the record.

MAP1(5,J) = inverted list number.
(0 indicates no inverted list)

3.1.2 Drive Table MAP2

MAP2(1,J)-
MAP2(3,J) = mnemonic name.

MAP2(4,J) = length of mnemonic name.

MAP2(5,J) > 0; points to column in array MAP1.
(a basic variable or synonym)

< 0; points to a column in array MAP3.
(a group variable)

MAP2(6,J) = inverted list number.
(0 indicates no inverted list)

3.1.3 Drive Table MAP3

MAP3(1,J)-
MAP3(8,J) = points to columns in array MAP1. Zeros are used when fewer than eight items in a group. If the first index is less than zero, then the items are not sorted alphabetically when printed in queries.

3.1.4 Drive Table MAP4

MAP4(1,J)-
MAP4(3,J) = mnemonic name.

MAP4(4,J) = length of mnemonic name.

MAP4(5,J) = number of the byte in the classification of comments pertaining to this subject.

3.1.5 Drive Table LCLASS

LCLASS(I) - location of comment classification.

3.1.6 Drive Table LCMNT

LCMNT(I) - location of comment.

3.2 Task Element Drive Tables

The Task Element drive tables are located in common block ENAME.

3.2.1 Drive Table NAME

NAME(1,J)-
NAME(3,J) = mnemonic name.

NAME(4,J) = length of mnemonic name.

NAME(5,J) = byte location within record.

NAME(6,J) = number of bytes in value.

NAME(7,J) = number of routine used to test the data for validity.

NAME(8,J) = inverted list number.
(0 indicates no inverted list)

3.2.2 Drive Table ICNAME

ICNAME(1,J)-
ICNAME(3,J) = mnemonic name.

ICNAME(4,J) = number of the byte in the classification of comments pertaining to this subject.

3.2.3 Drive Table ISNAME

ISNAME(1,J)-
ISNAME(3,J) = mnemonic name.

ISNAME(4,J) = number of bytes in value.

ISNAME(5,J) = byte location within record.

ISNAME(6,J) = index of routine used to test the data for validity.

ISNAME(7,J) = inverted list number.
(0 indicates no inverted list)

3.2.4 Drive Table IGNAME

IGNAME(1,J)-
IGNAME(3,J) = mnemonic name.

IGNAME(4,J) = number of bytes in value.

IGNAME(5,J) = number of items in group.

IGNAME(6,J)-
IGNAME(20,J)= byte location within record.

IGNAME(21,J) = 0 items are not sorted alphabetically or
1 items are sorted alphabetically.

IGNAME(22,J) = index of routine used to test the data for validity.

IGNAME(23,J) = inverted list number.
(0 indicates no inverted list)

3.2.5 Drive Table IECLAS

IECLAS(I) = location of comment classification.

3.2.6 Drive Table LCMNT

LCMNT = location of comment.

4. LOAD MODULES

Figure 4.1 shows what subsystem or program requires for each load module. Figure 4.2 shows the CSECT (i.e., programs and common blocks) stored in each load module.

LOAD MODULE NAME	DESCRIPTION	WHERE USED										
		REINSTATE CONTROL/DISPLAY FILE	CONTROL/DISPLAY FILE MAINTENANCE	BACKUP CONTROL/DISPLAY FILE	CREATED CONTROL/DISPLAY INVERTED LISTS	REINSTATE TASK ELEMENT FILE	TASK ELEMENT FILE MAINTENANCE	BACKUP TASK ELEMENT FILE	CREATE TASK ELEMENT INVERTED LISTS	CREATE PACKED INVERTED LISTS	QUERY	CONTROL/DISPLAY TASK ELEMENT CROSS REF.
VJB1ASM	ASSEMPLY ROUTINES FOR CHARACTER MANIPULATION		X		X		X		X	X	X	X
VJB1BUCD	BACKUP CONTROL/DISPLAY FILE			X								
VJB1BUTE	BACKUP TASK ELEMENT FILE							X				
VJB1BYSR	BINARY SEARCH						X				X	X
VJB1CDUP	CONTROL/DISPLAY FILE MAINTENANCE ROUTINES		X									
VJB1CDVR	VERIFIES CONTROL/DISPLAYS						X				X	
VJB1DA	DIRECT ACCESS ROUTINES		X		X		X		X		X	X
VJB1DETL	DETAIL LIST FOR CONTROL/DISPLAYS										X	
VJB1DLTE	DETAIL LIST FOR TASK ELEMENTS										X	
VJB1DRVT	CONTROL/DISPLAY DRIVE TABLES		X		X		X				X	
VJB1DTTE	DETERMINES TASK ELEMENT PARAMETERS										X	
VJB1LDCD	REINSTATES CONTROL/DISPLAY FILE	X										
VJB1LDTE	REINSTATES TASK ELEMENT FILE					X						
VJB1NLIS	CREATES CONTROL/DISPLAY INVERTED LISTS				X							
VJB1PACK	CREATES PACKED INVERTED LISTS									X		
VJB1PKTE	CREATES TASK ELEMENT INVERTED LISTS								X			
VJB1PRSE	PARSES QUERIES										X	
VJB1PRT	PRINT REPORT WRITER										X	
VJB1PRTS	PRINT-SORTED REPORT WRITER										X	
VJB1QERY	QUERY MAIN PROGRAM										X	
VJB1QUER	EVALUATES WHEN STATEMENTS - SELECTS RECORDS										X	
VJB1SEQ	INVERTED LIST INPUT/OUTPUT						X				X	X
VJB1STBK	STORY-BOOK REPORT WRITER										X	
VJB1TEFM	TASK ELEMENT FILE MAINTENANCE						X					
VJB1TERE	CONTROL/DISPLAY - TASK ELEMENT CROSS REFERENCE											X
VJB1TETB	TASK ELEMENT DRIVE TABLES						X				X	
VJB1TEVR	VERIFICATION FOR TASK ELEMENT RECORDS						X				X	
VJB1THEL	PROCESSES THESAURUS						X				X	
VJB1UPDA	CONTROL/DISPLAY FILE MAINTENANCE MAIN PROGRAM		X									
VJB1WRT	WRITES RECORDS ONTO INVERTED LISTS								X			

FIGURE 4.1 LOAD MODULE USAGE

VJBIASM	VJBIBUCD	VJBIBUTE	VJBIBYSR
ICNVRT	MAIN	MAIN	BYSRCH
REVERT			
MVPACK			
INSERT			
ICOMP			
$$FORMF1			
FCNVRT			

VJBICDUP	VJBICDVR	VJBIDA	VJBIDETL
REPLCE	IDMTCH	WRITDA	NEWREC
DELETE	VLMTCH	READDA	NEWITM
INITLZ	RLMTCH	DELREC	KNTCHR
NUITEM	NTIALZ	OPENDA	CDLIST
SEGMNT	IROW		ADAPT
CDRCRD	CDVRFY		
NEWREC	CDNAME		
ADD			
ADAPT			
KNTCHR			
ISQNTL			
TPFILL			
CDFILL			
IROW			
ZDFILL			
ZRFILL			
CRDCHK			

VJBIDLTE	VJBIDRVT	VJBIDTTE	VJBILDCD
NEWREC	CDMAP1	VRFVAL	MAIN
NEWITM	COMAP2	TEPARM	
KNTCHR	CDMAP3		
CDLIST	COMAP4		
ADAPT			

FIGURE 4.2 CSECTS

VJBILDTE	VJBINLIS	VJBIPACK	VJBIPKTE
MAIN	IROW MAIN	MAIN	MAIN

VJBIPRSE	VJBIPRT	VJBIPRTS	VJBIQERY
RMBLKS PSTFIX PARSER COMMND DTVERB DTPARM DTEXP CARDIN	IPRT	SORT IPRTS	IREPRT EVAL MAIN

VJBIQUER	VJBISEQ	VJBISTBK	VJBITEFM
TRUTH TRNSMT STORE RETREV QUERY OR NITIAL LISTS KSORT2 KWSRT2 KSORT KWKSRT ISQNTL DUPOUT CHKVAR CHKPAR AND	REWIND READSQ	QUEUE NITALZ LINBUF CNST RPNTRS LCOUNT TERCRD NCHARS LOCATN DISPLA AVCD IDENT RMARKS PRINTE	DELETE FIELDS DISECT MAIN TESTOP SETLMT SAVEKY RENUMR OURLAP NXTCRD KEYCHG CHGNUM CONTRL REPLCE PARSE INITLZ NUMTE INITE ADDIE ADD

FIGURE 4.2 CSETS (continued)

VJBITERE	VJBITETB	VJBITEVR	VJBITHEL
MAIN	ENAME	TIME	LDTHES
LBUFF		TENUMB	REFORM
CRAM		SOURCE	
READCD		RMRKC	
READLT		OPRTR	
		OPRATR	
		INTR	
		INTER	
		CUE	
		COMMNT	
		CNTDPY	
		CLAUSE	
		ACTION	

VJBIUPDA	VJBIWRT
MAIN	MAIN
FIELDS	
DISECT	

FIGURE 4.2 CSECTS (continued)